Land West of White Post Road, Banbury

Air Quality Assessment

On behalf of **Gladman Developments**

Project Ref: 29541/003 | Rev: Issued | Date: July 2015

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Contents

Tables

Appendices

1 Introduction

1.1 Introduction

1.1.1 Gladman Developments has commissioned Peter Brett Associates LLP to undertake an air quality assessment in support of the planning application on land west of White Post Road, Banbury. The proposed development lies within the boundary of Cherwell District Council.

1.1.2 The proposed development site is located to the west of White Post Road and to the south of Sycamore Drive. It will consist on the provision of up to 280 dwellings.

1.2 Scope

1.2.1 This report describes existing air quality within the study area, considers the suitability of the site for residential development, and assesses the impact of the construction activities on air quality in the surrounding area. The main air pollutants of concern related to construction are dust and fine particulate matter (PM_{10}), and for road traffic they are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}).

1.2.2 The assessment has been prepared taking into account relevant local and national guidance and regulations.

2 Legislation and Policy

2.1 The Air Quality Strategy

2.1.1 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.

2.1.2 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002.

2.1.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

2.1.4 The Local Air Quality Management Technical Guidance 2009 (LAQM.TG (09))[1] issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM_{10}) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure.

2.2 EU Limit Values

2.2.1 The Air Quality Standards Regulations 2010 implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO_2. These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO_2 EU Limit Value was 1 January 2010, five years later than the date for the NAQO.

2.2.2 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.

2.2.3 The Directive limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation;
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

[1] Defra, 2009, Local Air Quality Management Technical Guidance LAQM.TG(09).

2.3 Planning Policy

National Policy

2.3.1 The National Planning Policy Framework was published in March 2012. This sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

"*The planning system should contribute to and enhance the natural and local environment by…. preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."*

2.3.2 Paragraph 124, also states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

2.3.3 Paragraph 203 goes on to say:

"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."

Planning Practice Guidance

2.3.4 The Planning Practice Guidance (PPG) was published in March 2014 to support the NPPF. Paragraph 001, Reference 32-001-20 of the PPG provides a summary as to why air quality is a consideration for planning:

"…Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit….The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date….If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan…..Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive…..Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

2.3.5 Paragraph 002, Reference 32-002-20140306, of the PPG concerns the role of Local Plans with regard to air quality:

"….Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider:

- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;*

- *the impact of point sources of air pollution..; and*

- *ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."*

2.3.6 Paragraph 005, Reference 32-005-20140306, of the PPG identifies when air quality could be relevant for a planning decision:

"….When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*

- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.*

- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*

- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*

- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

2.3.7 Paragraph 007, Reference 32-007-20140306, of the PPG provides guidance on how detailed an assessment needs to be:

"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."

2.3.8 Paragraph 008, Reference 32-008-20140306, of the PPG provides guidance on how an impact on air quality can be mitigated:

"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact….Examples of mitigation include:

- *the design and layout of development to increase separation distances from sources of air pollution;*
- *using green infrastructure, in particular trees, to absorb dust and other pollutants;*
- *promoting infrastructure to promote modes of transport with low impact on air quality;*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."*

2.3.9 Paragraph 009, Reference 32-009-20140306, of the PPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment:

"Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations." If Yes:

"Consider how proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused."

Local Policy

2.3.10 The Cherwell Local Plan[2], adopted in 1996, sets out the local development policies for the borough. The Plan does not contain any specific policies relating to air quality, however, Policy ENV1 states:

"Development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other types of environmental pollution will not normally be permitted.

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."

2.3.11 The emerging Cherwell Local Plan (2011 – 2031) submitted in January 2014 will (upon its adoption) set out broadly the long term spatial vision for the District. Policy ESD 10 'Protection and Enhancement of Biodiversity and the Natural Environment', states:

"Protection and enhancement of biodiversity and the natural environment will be achieved by the following:…Air quality assessments will also be required for development proposals that would significantly adversely impact on biodiversity by generating and increase in air pollution."

2.3.12 The Draft Planning Obligations SPD provides guidance on the level of contribution which will be required in order to compensate for loss or damage created by a development, or to mitigate a development's impact. It sets out the range of mitigation measures which may be required, as well as the means of calculating financial contributions towards measures or monitoring, based on the cost of Air Quality Action Plan measures. An AQMA comprising North Bar Street, Horse Fair Street, South Bar, Oxford Street, High Street, Bloxham Road, Warwick Road and Southam Road was declared 29th October 2014; Cherwell District Council has not yet prepared an Air Quality Action Plan for its existing AQMAs (Hennef Way and North

[2] Available at: www.cherwell.gov.uk/index.cfm?articleid=1720

Bar/Horse Fair/South Bar Street). None of the mentioned AQMAs are in close proximity to the Application Site.

3 Methodology

3.1 Existing Conditions

3.1.1 Information on existing air quality has been obtained by collating the results of available monitoring carried out by Cherwell District Council (CDC). Background concentrations for the study area have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[3].

3.2 Construction Impacts

3.2.1 During construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.

3.2.2 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100m of sources. Intermediate particles (10-30µm) can travel 200-500m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1km; however, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

3.2.3 The Institute of Air Quality Management (IAQM, 2014) has issued revised guidance on the assessment of dust from demolition and construction. The IAQM guidance recommends that the risk of dust generation is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.

3.2.4 In accordance with the IAQM 2014 guidance, the dust emission magnitude is defined as high, medium or low (**Table 3.1**) taking into account the general activity descriptors on site and professional judgement.

3.2.5 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2014 guidance (**Table 3.2**), taking into account professional judgement.

Table 3.1: Criteria for Dust Emission Magnitude

Dust Emission Magnitude	Activity
High	**Demolition** >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously,

[3] http://laqm.defra.gov.uk/maps/maps2010.html

Dust Emission Magnitude	Activity
	>8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100m unpaved roads
Medium	**Demolition** 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 - 100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 -100m unpaved roads
Low	**Demolition** <20,000m^3 building demolished, non-dusty material, <10m above ground level, work in winter
	Earthworks <2,500m^2 site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved
	Construction <25,000m^3, non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

Table 3.2: Area Sensitivity Definitions

Area Sensitivity	People and Property Receptors	Ecological Receptors
High	>100 dwellings, hospitals, schools, care homes within 50m 10 – 100 dwellings within 20m Museums, car parks, car showrooms within 50m PM_{10} concentrations approach or are above the daily mean objective.	National or Internationally designated site within 20m with dust sensitive features / species present

Area Sensitivity	People and Property Receptors	Ecological Receptors
Medium	>100 dwellings, hospitals, schools, care homes within 100m 10 – 100 dwellings within 50m Less than 10 dwellings within 20m Offices/shops/parks within 20m PM_{10} concentrations below the daily mean objective.	National or Internationally designated site within 50m with dust sensitive features / species present Nationally designated site or particularly important plant species within 20m
Low	>100 dwellings, hospitals, schools, care homes 100 - 350m away 10 – 100 dwellings within 50 – 350m Less than 10 dwellings within 20 - 350m Playing fields, parks, farmland, footpaths, short term car parks, roads, shopping streets PM_{10} concentrations well below the daily mean objective.	Nationally designated site or particularly important plant species 20 - 50m Locally designated site with dust sensitive features within 50m

3.2.6 Based on the dust emission magnitude and the area sensitivity, the risk of dust impacts is then determined (**Table 3.3**), taking into account professional judgement.

Table 3.3: Risk of Dust Impacts

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

3.2.7 Based on the risk of dust impacts, appropriate mitigation is selected from the IAQM 2014 guidance using professional judgement.

Significance Criteria

3.2.8 The construction impact significance criteria are based on the IAQM 2014 guidance. The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations. With appropriate mitigation in place, the residual effect of construction impacts on air quality is assessed as not significant.

3.3 Road Traffic Impacts

Sensitive Locations

3.3.1 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be

residential properties, schools, nursing homes, etc. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links.

3.3.2 Based on the above criteria, sixteen existing properties have been identified as receptors for the assessment. These locations are described in **Table 3.4** and shown in **Figure 1**. Receptors were modelled at a height of 1.5m and 4.5m representing ground floor and first floor exposure.

3.3.3 Concentrations have also been predicted at one location within the proposed development site in order to determine whether air quality will be acceptable for future residents of the site (**Figure 1**). The receptor was placed 5m from the nominal location of the kerb of the access road through the site.

3.3.4 In order to verify the model results, concentrations have been predicted at seven diffusion tubes located in close proximity to the proposed site (see **Appendix C** for further details on the verification method).

Table 3.4: Description of Receptor Locations

Receptor	Location	Model Height (m)
R1	The Coach House, White Post Road	1.5
R2	2 Sycamore Drive	1.5
R3	1 Oxford Road, Bodicote	1.5
R4	16 Poplar Close	1.5
R5	17 Homestead Road	1.5
R6	5 Wheatley Close	1.5
R7	Horton General Hospital, Oxford Road	1.5
R8	69 Oxford Road	1.5
R9	58 Oxford Road	1.5
R10	7 Oxford Road	1.5
R11	8 Oxford Road	1.5
R12	5 South Bar Street	4.5
R13	55 South Bar Street	1.5
R14	15 to 30 Peoples Place	1.5
R15	15 to 30 Peoples Place	1.5
R16	The Three Pigeons Inn, 3 Southam Road	4.5
R17	Bishop Loveday C of E Primary School	1.5

Impact Predictions

3.3.5 Predictions have been carried out using the ADMS-Roads dispersion model (v3.2.4.0). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of Heavy Duty Vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using 2013 meteorological data from the Church Lawford monitoring station, which is considered suitable for this area.

3.3.6 Annual Average Daily Traffic (AADT) flows and the proportion of HDV, for roads within 250m of the proposed site have been provided by the project transport consultants (Ashley Helme

Associates). Traffic speeds were based on speed limits, taking into account the proximity to a junction. Traffic data used in this assessment are summarised in **Appendix D**.

3.3.7 Predictions have been made for the impact of development traffic as well as a sensitivity test assuming traffic from the adjacent land promotion site to the west passes through the proposed development site.

3.3.8 Emissions were calculated using the recently released Emission Factor Toolkit (EFT) v6.0.2, which utilises NO_x emission factors taken from the European Environment Agency COPERT 4 (v10) emission tool. The traffic data were entered into the EFT, along with speed data to provide combined emission rates for each of the road links entered into the model. In order to provide a worst-case assessment, and to remove uncertainty relating to future year vehicle emission factors, 2025 traffic data has been combined with 2020 emissions and background concentrations.

Assessment Criteria

3.3.9 The NAQOs for NO_2 and PM_{10} set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 3.5**.

Table 3.5: Nitrogen Dioxide and PM_{10} Objectives

Pollutant	Time Period	Objective
Nitrogen dioxide (NO_2)	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40µg/m^3
Particulate matter (PM_{10})	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40µg/m^3

3.3.10 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Analysis of long term monitoring data suggests that if the annual mean nitrogen dioxide concentration is less than 60µg/m^3 then the one-hour mean nitrogen dioxide objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved[4].

Significance

3.3.11 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by the Institute of Air Quality Management and specified in their guidance document on Land-Use Planning and Development Control[5], has therefore been used.

3.3.12 The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective.

3.3.13 **Table 3.6** sets out the impact magnitude descriptors, whilst **Table 3.7** sets out the impact descriptors.

[4] Defra, 2009. Local Air Quality Management Technical Guidance LAQM.TG (09).

[5] Moorcroft and Barrowcliffe et al. (2015). 'Land-Use Planning & Development Control: Planning for Air Quality. Institute of Air Quality Management, London.

Table 3.6: Impact Magnitude for changes in Ambient Pollutant Concentrations

Magnitude (% Change in Concentration)	Annual Mean NO_2 and PM_{10} ($40\mu g/m^3$)	Annual Mean of $32\mu g/m^3$ equating to 35 days with PM_{10} above $50\mu g/m^3$
Large (>10)	$>4\mu g/m^3$	$>3.2\mu g/m^3$
Medium (>5 - ≤10)	$>2 – \leq 4\mu g/m^3$	$>1.6 – \leq 3.2\mu g/m^3$
Small (>1 - ≤5)	$>0.4 – \leq 2\mu g/m^3$	$>0.32 – \leq 1.6\mu g/m^3$
Imperceptible (≤1)	$\leq 0.4\mu g/m^3$	$\leq 0.32\mu g/m^3$

Table 3.7: Impact Descriptor for Changes in Concentration at a Receptor

% Change in Concentrations with the Development in relation to Objective/ Limit Value	Change in concentration			
	Imperceptible	Small	Medium	Large
>110 (a)	Moderate	Substantial	Substantial	Substantial
>102 - ≤110 (b)	Moderate	Moderate	Substantial	Substantial
>95 - ≤102 (c)	Slight	Moderate	Moderate	Substantial
>75 - ≤95 (d)	Negligible	Slight	Moderate	Moderate
≤75 (e)	Negligible	Negligible	Slight	Moderate

Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
(a) NO_2 or PM_{10}: $>44\mu g/m^3$ annual mean; PM_{10}, $>35.2\mu g/m^3$ annual mean (days)
(b) NO_2 or PM_{10}: $>40.8 - \leq 44\mu g/m^3$ annual mean; PM_{10}, $>32.64 - \leq 35.2\mu g/m^3$ annual mean (days)
(c) NO_2 or PM_{10}: $>38 - \leq 40.8\mu g/m^3$ annual mean; PM_{10}, $>30.4 - \leq 32.64\mu g/m^3$ annual mean (days)
(d) NO_2 or PM_{10}: $>30 - \leq 38\mu g/m^3$ annual mean; PM_{10}, $>24 - \leq 30.4\mu g/m^3$ annual mean (days)
(e) NO_2 or PM_{10}: $\leq 30\mu g/m^3$ annual mean; PM_{10}, $\leq 24\mu g/m^3$ annual mean (days)

3.3.14 The guidance states that the assessment of significance should be based on professional judgement, taking into account the following factors, with the overall air quality effect of the scheme described as either 'insignificant', or of 'minor', 'moderate' or 'major' significance:

- Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance.
- The magnitude of the changes and the descriptions of the impacts at the receptors i.e. **Tables 3.6** and **3.7** findings;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced;
- Uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent to which an objective or limit value is exceeded.

4 Existing Air Quality

4.1 LAQM

4.1.1 CDC has investigated air quality within its area as part of its responsibilities under the LAQM regime. To date, three Air Quality Management Areas (AQMAs) have been declared within the district. The closest of which is approximately 1.8km from the proposed development site, which encompasses North Bar Street, Horse Fair Street, South Bar Street, Oxford Road, Bloxham Road, High Street Warwick Road and Southam Road.

4.2 Monitoring

Nitrogen Dioxide

4.2.1 CDC operates an automatic monitoring station alongside Hennef Way, which is outside of the study area for this assessment. The Council also deploys nitrogen dioxide diffusion tubes, prepared and analysed by Bristol Scientific Services (20% TEA in water), at a number of locations including eight within Banbury town centre (**Figure 1**). Data for these sites are presented in **Table 4.1**.

Table 4.1: Measured Nitrogen Dioxide Concentrations, 2010 - 2013

Site	Site Type	Annual Mean (µg/m^3)			
		2010	2011	2012	2013
Oxford Road	Kerbside	**45.5**	**40.4**	**40.9**	26.8
High Street*	Kerbside	**43.0**	**42.0**	39.6	38.3
North Bar*	Kerbside	**42.0**	**43.8**	**40.3**	37.4
Warwick Road*	Roadside	31.1	29.6	26.4	25.3
Southam Road*	Kerbside	39.0	36.0	37.4	32.4
South Bar	Roadside	31.7	24.1	23.4	24.5
Oxford Rd / South Bar*	Kerbside	**43.8**	39.7	38.3	39.9
Bloxham Road*	Kerbside	**44.9**	**46.2**	**44.2**	37.8
Horsefair / North Bar*	Roadside	**47.9**	**47.3**	**45.4**	**42.2**
Objective	**40**				

Exceedences highlighted in bold.
2010 – 2012 Data taken from 2013 USA Report Cherwell District Council
2013 Data taken from 2014 Air Quality Progress Report Cherwell District Council
*Used for model verification

4.2.2 The measured concentrations of nitrogen dioxide have been below the objectives in the majority of the monitoring sites in 2013, except for one location where concentrations exceeded the objective (Horsefair/ North Bar). North Bar, Bloxham Road and Horsefair/North Bar have registered exceedances since 2010; however concentrations have reduced over that time period.

Particulates

4.2.3 There is no PM_{10} monitoring carried out in close proximity to the site.

4.3 Background Concentrations

4.3.1 In addition to these measured concentrations, estimated background concentrations for the

study area have been obtained from the national maps (**Table 4.2**) for the years 2013 and 2020.

Table 4.2: Estimated Annual Mean Background Concentrations in 2013 and 2020 (µg/m^3).

Year	Grid Ref.	NO_x	NO_2	PM_{10}
2013	445_238	15.6	11.5	16.6
	446_238	13.1	12.6	16.9
2020	445_238	11.9	8.9	15.6
	446_238	13.1	9.8	15.8
Objectives		**-**	**40**	**40**

4.3.2 The background concentrations are all well below the relevant objectives in 2013 and 2020.

4.4 Predicted Baseline Concentrations

4.4.1 The ADMS-Roads model has been run to predict baseline nitrogen dioxide and PM_{10} concentrations at each of the existing receptor locations identified in **Table 3.4**. **Table 4.3** set out the results for the baseline scenarios.

Table 4.3: Predicted Baseline Concentrations of NO_2 and PM_{10} in 2013 and 2025

Receptor	NO_2		PM_{10}	
	Annual Mean (µg/m^3)		Annual Mean (µg/m^3)	
	2013	2025	2013	2025
R1	15.0	11.5	17.0	15.9
R2	17.6	13.6	17.3	16.3
R3	22.0	16.9	18.1	17.2
R4	19.9	15.3	17.8	16.7
R5	23.7	18.6	18.2	17.2
R6	20.2	15.6	17.8	16.8
R7	26.8	21.2	17.8	16.7
R8	37.4	29.6	18.8	17.6
R9	25.9	20.5	17.7	16.5
R10	**48.0**	38.4	20.9	19.4
R11	**42.4**	33.9	20.2	18.8
R12	31.0	25.0	19.0	17.7
R13	37.9	29.0	19.7	18.2
R14	37.0	31.1	19.7	18.5
R15	31.7	26.5	19.9	18.6
R16	39.0	32.0	19.1	17.9
R17	17.3	12.7	18.9	17.8
Objectives	**40**		**40**	

Exceedances highlighted in bold

4.4.2 The annual mean nitrogen dioxide objective is predicted to be met at all but two locations R10 and R11, in close proximity to the junction of Bloxham Road/Oxford Road/South Bar Street in 2013. Predicted PM_{10} concentrations are well below the relevant objectives.

4.4.3 By 2025, improvements in vehicle emissions are predicted to lead to significant reductions in pollutant concentrations.

5 Impact Assessment

5.1 Construction

5.1.1 The main potential effects during construction are dust deposition and elevated PM_{10} concentrations. The following activities have the potential to cause emissions of dust:

- Site preparation including delivery of construction material, erection of fences and barriers;
- Earthworks including digging foundations and landscaping;
- Materials handling such as storage of material in stockpiles and spillage;
- Movement of construction traffic including haulage, vehicles and plant movements;
- Construction and fabrication; and
- Disposal of waste materials off-site.

5.1.2 Typically the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

5.1.3 Based on the IAQM criteria (**Table 3.1**), the risk of dust emissions is considered to be medium. The study area is considered to be of medium sensitivity (**Table 3.2**). Appropriate mitigation corresponding to a medium risk site is therefore required during the construction phase (**Table 3.3**).

5.2 Road Traffic Impacts

Existing Receptors

5.2.1 Predicted concentrations of nitrogen dioxide and PM_{10} at existing receptors in 2025 both without and with the development in place are presented in **Table 5.1.**

Table 5.1: Predicted Concentrations of NO_2 and PM_{10} without and with the development in place.

Receptor	2025 Baseline		2025 With Development	
	NO_2	PM_{10}	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
R1	11.5	15.9	12.2	16.0
R2	13.6	16.3	14.1	16.3
R3	16.9	17.2	17.3	17.2
R4	15.3	16.7	15.7	16.8
R5	18.6	17.2	19.2	17.3
R6	15.6	16.8	16.1	16.8
R7	21.2	16.7	21.4	16.7
R8	29.6	17.6	30.1	17.7
R9	20.5	16.5	20.7	16.6

Receptor	2025 Baseline		2025 With Development	
	NO_2	PM_{10}	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
R10	38.4	19.4	38.8	19.4
R11	33.9	18.8	34.1	18.8
R12	25.0	17.7	25.2	17.7
R13	29.0	18.2	29.1	18.2
R14	31.1	18.5	31.2	18.5
R15	26.5	18.6	32.2	17.9
R16	32.0	17.9	26.6	17.0
R17	12.7	17.8	11.8	17.5
Objectives	**40**	**40**	**40**	**40**

5.2.2 The changes in annual mean NO_2 and PM_{10} concentrations are presented in **Table 5.2.**

Table 5.2: Change in Predicted Concentrations brought about by the Development.

Receptor	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
R1	0.7	0.1
R2	0.5	0.1
R3	0.4	0.1
R4	0.5	0.1
R5	0.6	0.1
R6	0.5	0.1
R7	0.3	0.0
R8	0.4	0.1
R9	0.2	0.0
R10	0.4	0.1
R11	0.2	0.0
R12	0.1	0.0
R13	0.1	0.0
R14	0.1	0.0
R15	0.1	-0.7
R16	0.1	-0.9
R17	0.7	-1.9

Based on unrounded numbers

5.2.3 Based on the impact magnitude descriptors presented in **Table 3.6**, the changes in annual mean nitrogen dioxide concentrations range from imperceptible to small, and the changes in PM_{10} concentrations range from imperceptible to small.

5.2.4 Using the criteria set out in **Table 3.7**, the impacts are therefore all described as negligible, apart from (for nitrogen dioxide) receptors R8 and R10, where the impacts are judged to be slight adverse.

Proposed Receptors

5.2.5 Predicted concentrations of nitrogen dioxide and PM_{10} at 5m from the kerb of the road within

the proposed development are presented in **Table 5.3.**

Table 5.3: Predicted Concentrations within the Proposed Development Site.

Receptor	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
PR1	11.8	17.5
Objectives	**40**	**40**

5.2.6 Predicted concentrations are well below the relevant objectives at this worst-case location. Air quality for future residents of the proposed site is thus considered acceptable.

Sensitivity Test

5.2.7 A sensitivity test has been undertaken in order to predict nitrogen dioxide and PM_{10} concentrations assuming that the traffic from the adjacent land promotion site passes through the proposed development site. Predicted concentrations for the year 2025 at existing receptors are presented in **Table 5.4**.

Table 5.4: Predicted NO_2 and PM_{10} Concentrations at Existing Receptors in 2025

Receptor	2025 Sensitivity Test	
	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
R1	13.8	16.2
R2	15.1	16.4
R3	17.6	17.3
R4	16.4	16.9
R5	20.1	17.4
R6	16.5	16.9
R7	21.4	16.7
R8	30.1	17.7
R9	20.7	16.6
R10	38.8	19.4
R11	34.1	18.8
R12	25.2	17.7
R13	29.1	18.2
R14	31.2	18.5
R15	26.6	17.9
R16	32.2	18.6
R17	14.6	16.5
Objectives	**40**	**40**

5.2.8 The annual mean nitrogen dioxide and PM_{10} objective is not predicted to be exceeded at any of the existing receptor locations in 2025.

Proposed Receptors

5.2.9 A sensitivity test was also undertaken for the proposed receptor location located within the proposed site. Predicted concentrations of nitrogen dioxide and PM_{10} are presented in **Table 5.5**

Table 5.5: Predicted NO_2 and PM_{10} Concentrations at Proposed Receptors in 2025

Receptor	NO_2	PM_{10}
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
PR1	17.0	16.5
Objectives	**40**	**40**

5.2.10 There are no predicted exceedances of the nitrogen dioxide and PM_{10} relevant objectives in 2025. The site is therefore suitable for residential development, even with the additional traffic flow from the adjacent promotion site passing through the proposed development.

5.3 Uncertainty

5.3.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

5.3.2 Mean concentrations of nitrogen oxides and NO_2 has been identified in recent years[6]. Whilst projections suggest that both annual mean nitrogen oxides and nitrogen dioxide concentrations from road traffic emissions should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase.

5.3.3 The future year road traffic modelling has been based on 2020 emission factors and background concentrations whilst utilising traffic flows for 2025 which include predicted traffic growth both without and with the development in place. This is considered to provide an appropriately conservative assessment of the likely impacts of the proposed development, considering that monitoring in the area indicates that concentrations have reduced in recent years.

5.4 Effect Significance

5.4.1 The impact of additional road traffic generated by the development on air quality is judged to be insignificant. This judgement is made in accordance with the methodology set out in **paragraph 3.3.13**, in particular that the development does not cause exceedences of the objective, the majority of the impacts are negligible, air quality for future residents is acceptable, and a conservative assessment has been undertaken.

[6] Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. Trends in NO_x and NO_2 emissions and ambient measurements in the UK. Available at: http://uk-air.defra.gov.uk/library/reports?report_id=645

6 Mitigation

6.1 Construction

6.1.1 The following standard medium risk mitigation measures from the IAQM 2014 guidance are recommended to be included within a Construction Environmental Management Plan (CEMP) and to be agreed with the local authority.

Communication

- Develop and implement a stakeholder communications plan
- Display the name and contact details of persons accountable on the site boundary
- Display the head or regional office information on the site boundary

Management

- Develop and implement a dust management plan
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions
- Record exceptional incidents and action taken to resolve the situation
- Carry out regular site inspections to monitor compliance with the dust management plan and record results
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period
- Avoid site run off of water or mud
- Keep site fencing, barriers and scaffolding clean using wet methods
- Remove potentially dusty materials from site as soon as possible
- Cover, seed or fence stockpiles to prevent wind whipping
- Ensure all vehicles switch off engines when stationary
- Avoid the use of diesel or petrol powered generators where possible
- Produce a Construction Logistics Plan to manage the delivery of goods and materials
- Only use cutting, grinding and sawing equipment with dust suppression equipment

- Ensure an adequate supply of water on site for dust suppressant
- Use enclosed chutes and conveyors and covered skips
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate
- Ensure equipment is readily available on site to clean up spillages of dry materials
- No on-site bonfires and burning of waste materials on site

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process

Trackout

- Use water assisted dust sweepers on the site access and local roads
- Avoid dry sweeping of large areas
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable
- Install hard surfaced haul routes which are regularly damped down
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits
- The site access gate to be located at least 10m from receptors where possible

6.2 Operation

6.2.1 The air quality impacts of road traffic generated by the site are considered to be insignificant, and air quality for future residents has been shown to be acceptable. Therefore mitigation measures for the operational phase of the development are not considered necessary.

7 Conclusions

7.1.1 The air quality impacts associated with the construction and operation of the proposed residential development of land south of Banbury have been assessed. To date, three Air Quality Management Areas (AQMAs) have been declared within the district. The closest of which is approximately 1.8km from the proposed development site, which encompasses North Bar Street, Horse Fair Street, South Bar Street, Oxford Road, Bloxham Road, High Street Warwick Road and Southam Road.

7.1.2 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise the risk of elevated PM_{10} concentrations and dust nuisance in the surrounding area. With the proposed measures in place, construction dust impacts are judged to be not significant.

7.1.3 The impacts of development generated traffic on concentrations of nitrogen dioxide and PM_{10} have been assessed at sixteen receptors representative of existing properties adjacent to the affected road network. The proposed redevelopment is predicted to result in an imperceptible to small increase in nitrogen dioxide concentrations, and an imperceptible increase in PM_{10} concentrations. The development does not cause any exceedances of the air quality objectives, and the overall air quality impact of the development is considered to be insignificant.

7.1.4 Nitrogen dioxide and PM_{10} concentrations have also been predicted at one proposed receptor location within the proposed site. There are no predicted exceedances of the relevant objectives. Therefore, it is concluded that the proposed site is suitable for residential development.

7.1.5 A sensitivity test was undertaken in order to predict nitrogen dioxide and PM_{10} concentrations assuming a traffic flow from the adjacent land promotion site passes through the proposed development site. There are no predicted exceedances of the relevant objectives at any of the existing receptors or at the proposed receptor location within the site.

7.1.6 Overall, it is concluded that there are no air quality constraints to the proposed development. No further mitigations are therefore required.

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Appendix A Glossary

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Appendix A: Glossary

AADT	Annual Average Daily Traffic
AQMA	Air Quality Management Area
Diffusion Tube	A passive sampler used for collecting NO_2 in the air
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes Includes HGVs and buses
LAQM	Local Air Quality Management
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO_2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
PM_{10}	Small airborne particles less than 10μm in diameter
Receptor	A location where the effects of pollution may occur
TEA	Triethanolamine

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Appendix B References

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Appendix B: References

Department of the Environment, Food and Rural Affairs (Defra) (2013). *2010 Based Background Maps for NO_x, NO_2, PM_{10} and $PM_{2.5}$*. Available: http://laqm.defra.gov.uk/maps/maps2010.html.

Department of the Environment, Food and Rural Affairs (Defra) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2009). *Local Air Quality Management Technical Guidance, LAQM.TG(09).* HMSO, London.

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Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction, IAQM, London

Statutory Instrument 2000, No 921, *The Air Quality (England) Regulations 2000*, HMSO, London.

Statutory Instrument 2002, No 3034, *The Air Quality (England) (Amendment) Regulations 2002*, HMSO, London.

Statutory Instrument 2010, No. 1001, *The Air Quality Standards Regulations 2010*, HMSO, London

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Appendix C Verification

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Appendix C:

Nitrogen Dioxide

Most nitrogen dioxide is produce 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 emission of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the 2013 annual mean road-NO_x contribution at seven roadside and kerbside diffusion tube monitoring sites (identified in **Table 4.1**).

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO_2 concentrations and the background NO_2 concentrations within the NO_x from NO_2 calculator[7].

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure C1**). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure C2**).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor:	1.5645
Secondary adjustment factor:	1.0122

The results imply that the model was under-predicting the road-NO_x contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

Figure C3 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line.

[7] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

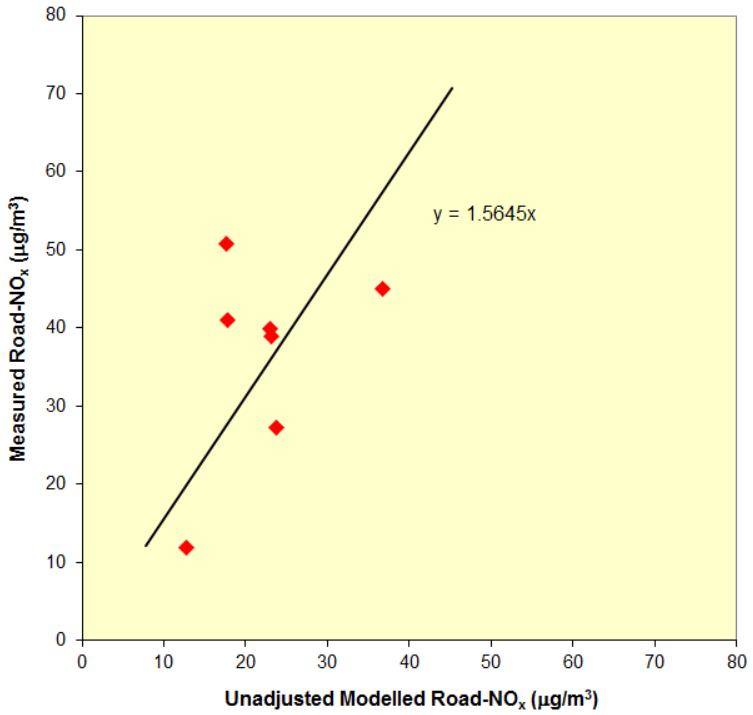

Figure C1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x Concentrations

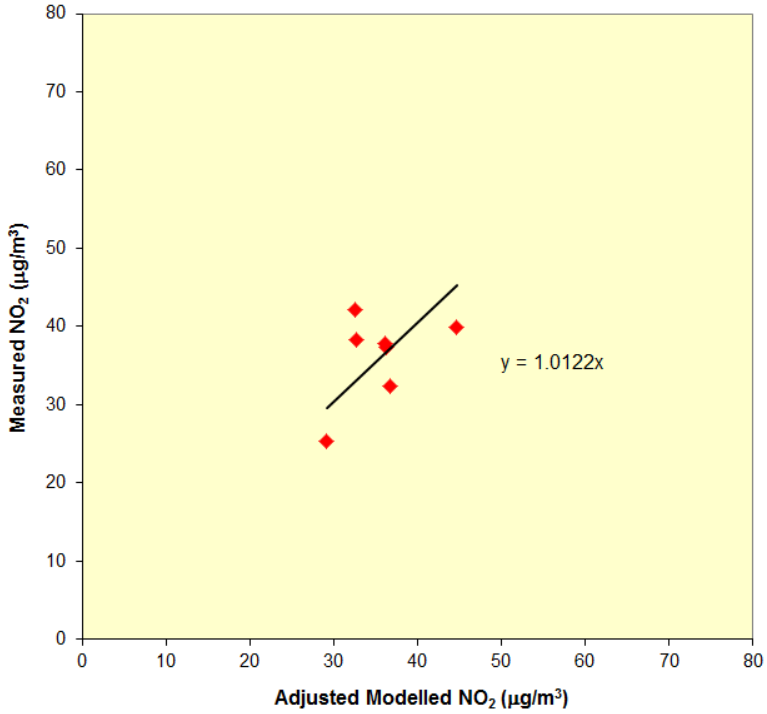

Figure C2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations

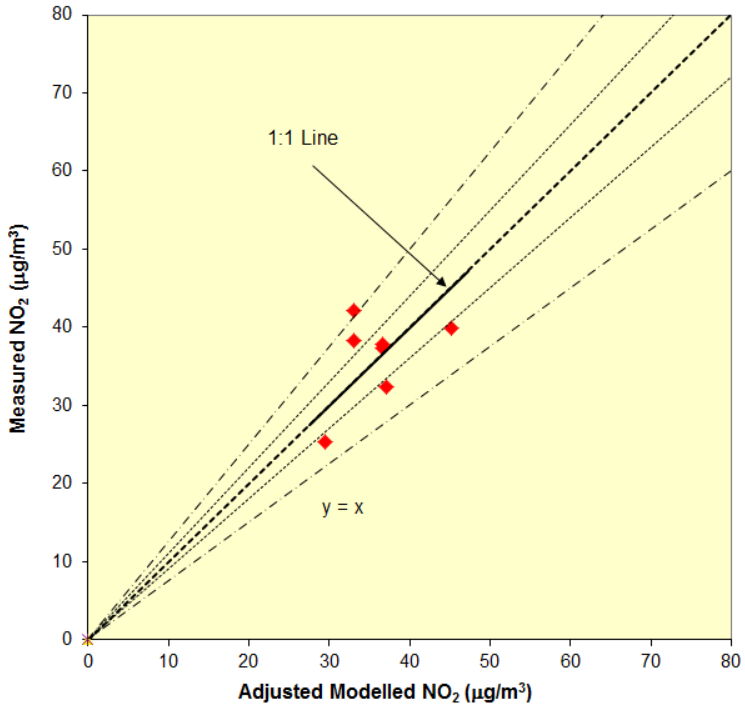

Figure C3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations

PM_{10}

There is no nearby monitoring of PM_{10} and it has therefore not been possible to verify the model outputs of PM_{10}. The primary adjustment factor calculated for nitrogen dioxide has therefore been applied to the modelled road-PM_{10} concentrations.

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Appendix D Traffic Data

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Appendix D: Traffic Data

Road	2013	2025 Base	2025 With Development	2025 Sensitivity	%HDV
White Post Road (South of Site Access)	7,497	7,079	8,754	11,188	1.7
White Post Road (North of Site Access)	7,497	7,079	8,754	7,678	1
Sycamore Drive	4,732	5,850	5,997	5,997	0.6
White Post Road (East of Sycamore Drive)	3,785	5,813	6,295	7,020	0.6
Bankside (North of Sycamore Drive)	9,525	10,545	11,592	13,300	1.3
Bankside (East of A4260 slip)	10,496	12,143	12,509	12,509	1
A4260 slip road	4,609	6,993	7,674	9,382	2.1
Oxford Road (South of Upper Windsor St)	19,222	25,907	26,787	26,787	3
Upper Windsor St	9,279	12,524	12,890	12,890	2.9
Bloxham Road	12,007	15,559	15,611	15,611	3
Oxford Road (North of Upper Windsor St)	16,850	21,962	22,475	22,475	2.7
Oxford Road (South of Bloxham Road	16,383	21,065	21,578	21,578	2.7
South Bar Street (North of Bloxham Road)	17,206	21,704	22,165	22,165	3
South Bar Street (South of High St)	15,817	19,172	19,633	19,633	2.6
High St	8,972	12,204	12,361	12,361	3.1
West Bar Street	9,279	10,225	10,246	10,246	3.5
North Bar (North of High St)	19,148	24,887	25,170	25,170	2.6
North Bar (South of Castle St	19,934	25,489	25,772	25,772	2.6
Castle St	8,984	15,817	15,817	15,817	2
Warwick Road	11,086	16,505	16,558	16,558	2.1
Southam Road	11,835	14,920	15,150	15,150	2.6
Site Access	-	-	1,926	7,678	1

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Appendix E Figures

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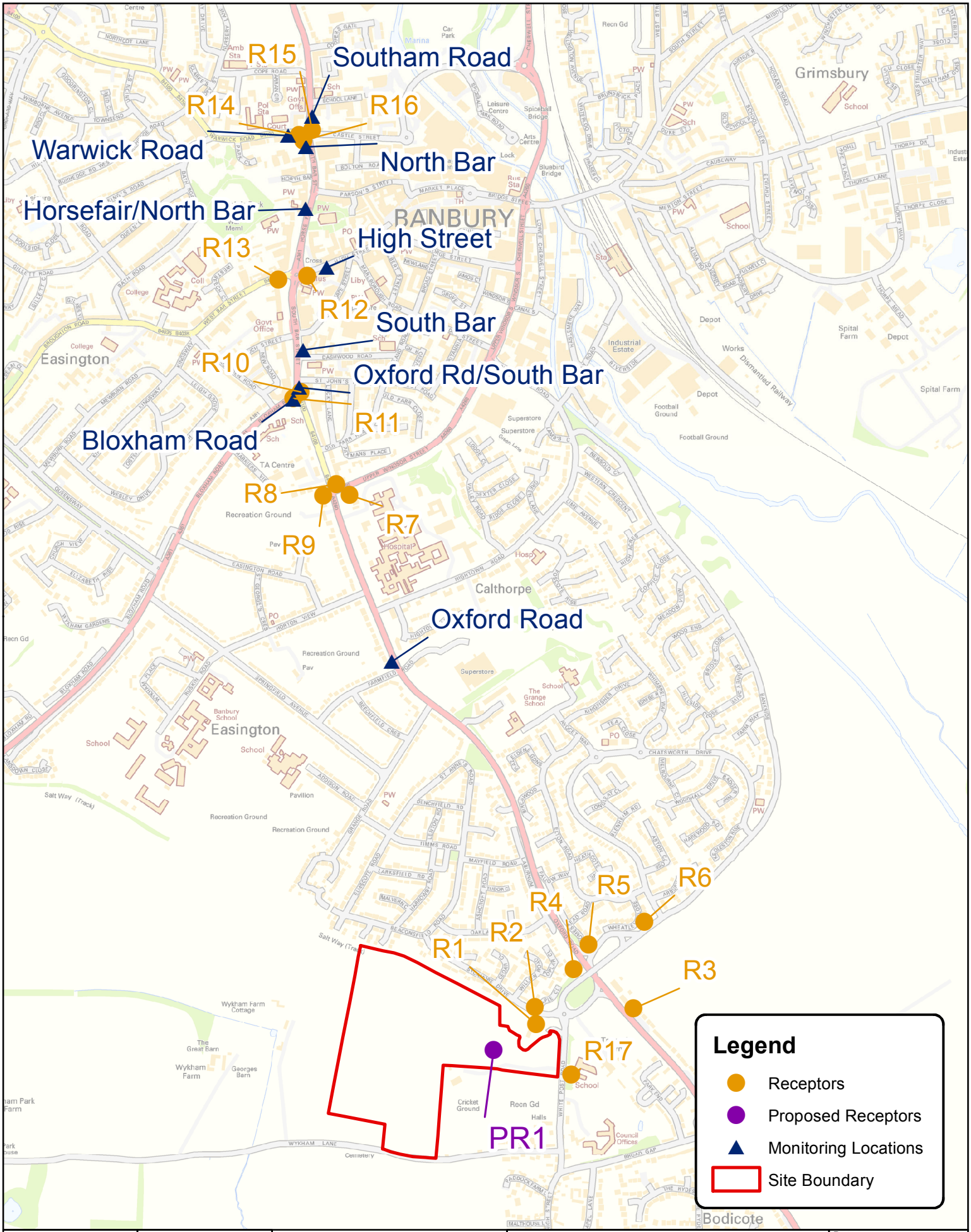

pba peterbrett www.pba.co.uk Peter Brett Associates LLP BRISTOL Tel: 0117 928 1560	Client Gladman Developments	0 0.15 0.3 Kilometres N Contains Ordnance Survey Data © Crown Copyright and Database Right 2015	**Land West of White Post Road, Banbury** Receptors and Monitoring Locations	Date 01/07/2015 Scale 1:12,790 @ A4 Drawn By YO Checked By GH Revision Number 01 Figure Number **Figure 1**

PBA BRISTOL Drive: J:\29541 Land south of Banbury\Air Quality\Plans and Figures\Updated assessment\Figure 1 June 2015.mxd

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