On behalf of
Kraft Foods UK Ltd and
Barwood Developments Ltd

Southam Road Retail Park, Banbury

Air Quality Assessment

Project Ref: 26004/008

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Executive Summary

Barwood Developments Ltd has commissioned Peter Brett Associates LLP (PBA) to undertake an air quality assessment for the proposed retail park development at Southam Road, Banbury.

This report is prepared in support of the planning application for the proposed development, which will provide a 60,000sqft foodstore, a petrol filling station and up to 80,000sqft of non-food retail. An assessment has been carried out to determine the impact of the proposed development on air quality in the local area, in particular, within Banbury town centre where the Council are currently undertaking a Detailed Assessment of air quality.

Concentrations of nitrogen dioxide and PM_{10} were predicted using the ADMS-Roads (v3) dispersion model. The development is predicted to bring about a small increase in concentrations at receptors adjacent to North Bar Street / Southam Road junction, which is judged to be of slight adverse significance. At all other locations, the impact is judged to be negligible. The overall air quality impact of the development is therefore judged to be insignificant. A Framework Travel Plan has been prepared for the site which will assist in mitigating the impact of the proposed development. It is concluded that the air quality impacts of development related traffic emissions do not provide any constraints to the proposed development.

The executive summary contains an overview of the key findings and conclusions. However, no reliance should be placed on any part of the executive summary until the whole of the report has been read.

1 Introduction

1.1 Proposed Development

1.1.1 Barwood Developments Ltd has commissioned Peter Brett Associates LLP (PBA) to undertake an air quality assessment for the proposed retail park development at Southam Road, Banbury.

1.1.2 The site is located between light industrial / retail and residential areas of the town on a section of the existing Kraft site. The proposed development will provide a 60,000sqft foodstore, a petrol filling station and up to 80,000sqft of non-food retail.

1.2 Scope

1.2.1 This assessment describes existing air quality in proximity to the site, and considers the impact of additional traffic generated by the development on air quality for existing residents adjacent to the local road network. The main air pollutants of concern related to traffic emissions are nitrogen dioxide and fine particulate matter (PM_{10}).

1.2.2 This assessment has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with Cherwell District Council.

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 is 1 January 2010 which is 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 UK has a time extension for compliance of the daily PM_{10} limit value in London until the end of 2011. Despite many areas of the UK not being compliant with the annual average NO_2 limit value, the UK has decided not to seek an extension to the compliance date for this

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

pollutant. This was on the basis that it could not be guaranteed that the UK would be compliant by the latest date allowable under the Directive (1 January 2015).

2.2.4 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.

2.2.5 The limit values are mandatory whereas there is no legal obligation to meet the NAQOs. Therefore, the limit values carry more weight than the NAQOs.

2.3 Assessment Criteria

Health Criteria

2.3.1 The NAQOs for nitrogen dioxide and PM_{10} set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 2.1**.

Table 2.1: 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

2.3.2 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 NO_2 concentration is less than 60µg/m^3 then the one-hour mean NO_2 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[2].

Significance

2.3.3 There is no official guidance in the UK on how to describe the nature of air quality impacts, nor to assess their significance. The approach developed by the Institute of Air Quality Management (IAQM), subsequently incorporated into the EPUK 2010 guidance, has therefore been used within this assessment to assist in describing the air quality impacts associated with the proposed development.

2.3.4 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.

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

2.3.5 **Table 2.2** sets out the impact magnitude descriptors, whilst **Table 2.3** sets out the impact descriptors.

Table 2.2: Impact Magnitude for changes in Ambient Pollutant Concentrations

Magnitude	Annual Mean NO_2 and PM_{10}	Number of Days with PM_{10} >50 µg/m^3
Large	≥ 4 µg/m^3	≥ 4 days
Medium	2 – <4 µg/m^3	3 – 4 days
Small	0.4 – <2 µg/m^3	1 – 2 days
Imperceptible	< 0.4 µg/m^3	< 1 day

Table 2.3: Impact Descriptor for Changes in Concentration at a Receptor

Absolute concentration with the development in relation to Objective / Limit Value	Change in concentration		
	Small	Medium	Large
Above objective/limit value [(a)]	Slight	Moderate	Substantial
Just below objective/limit value [(b)]	Slight	Moderate	Moderate
Below objective/limit value [(c)]	Negligible	Slight	Slight
Well below objective/limit value [(d)]	Negligible	Negligible	Slight

Notes:
Where the Impact Magnitude is Imperceptible, the Impact Descriptor is Negligible.
Where there is an increase in concentrations, the absolute concentration relates to the 'with development' air quality. Where there is a decrease in concentrations, the absolute concentration relates to the 'without development' air quality. Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
(a) Above: >40 µg/m^3 annual mean NO_2 or PM_{10}, or >35 days PM_{10} >50 µg/m^3
(b) Just below: 36 – 40 µg/m^3 annual mean NO_2 or PM_{10}, or 32 – 35 days PM_{10} > 50 µg/m^3
(c) Below: 30 – <36 µg/m^3 annual mean NO_2 or PM_{10}, or 26 – <32 days PM_{10} > 50 µg/m^3
(d) Well below: < 30 µg/m^3 annual mean NO_2 or PM_{10}, or < 26 days PM_{10} >50 µg/m^3

2.3.6 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 impact on the scheme described as either, 'insignificant', 'minor', 'moderate' or 'major':

- Number of properties affected by minor, moderate or major 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 2.2** and **2.3** 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.
- The extent to which an objective or limit value is exceeded.

2.4 Planning Policy

National Policy

2.4.1 Planning Policy Statement 23: Planning and Pollution Control (PPS23) sets out the Government's policies on air quality and planning. It identifies the consideration of air quality and potential air quality impacts arising from development as capable of being a material planning consideration. PPS23 states that in considering proposals for development, Local Planning Authorities (LPAs) should take account of the potential risks of and from pollution and land contamination and how these can be managed or reduced. It advises that the planning system should focus on whether the development itself is an acceptable use of land and the impacts of those uses rather than the control of processes or emissions themselves.

2.4.2 Annex 1G of PPS23 advises that for proposed developments inside or adjacent to AQMAs it is not the case that all planning applications should be refused if the development would result in a deterioration of local air quality as such an approach could sterilise development. Instead it states that LPAs, transport authorities and pollution control authorities should work together to ensure development has a beneficial impact on the environment. As road transport is recognised as a significant contributor to poor local air quality, particularly in urban areas, LPAs can play a key role by ensuring that developments reduce the need to travel and encouraging more sustainable travel choices.

Local Planning Policy

2.4.3 The Cherwell Local Plan[3], 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"

2.4.4 Recent changes to the planning legislation require the Council to replace the Local Plan with a Local Development Framework (LDF). Once adopted, this portfolio of planning documents will deliver the spatial development strategy for the local area and build upon existing local and regional strategies and initiatives. Policy ENV1 of the Local Plan has been saved whilst the LDF is developed.

2.4.5 The Draft Core Strategy sets out Strategic Environmental Objective SO 14, which aims:

"*To protect and enhance the natural environment and Cherwell's core assets, maximising opportunities for improving biodiversity and minimising pollution in urban and rural areas*."

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

2.4.6 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. A Detailed Assessment of air quality within Banbury town centre is currently underway, and an AQMA is likely to be declared; Cherwell District Council has not yet prepared an Air Quality Action Plan for its existing AQMA (Hennef Way).

3 Methodology

3.1 Existing Conditions

3.1.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by Cherwell DC. 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[4].

3.2 Road Traffic Impacts

Sensitive Locations

3.2.1 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 selecting 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.

3.2.2 Eight existing residential properties have been identified as receptors for the assessment. These locations are described in **Table 3.1** and shown in **Figure 1**.

Table 3.1: Description of receptor locations

Receptor[a]	Description
Receptor 1	49 Southam Road
Receptor 2	St Mary's CE Primary School, Southam Road
Receptor 3	Merisham Court, Southam Road
Receptor 4	Residential property above Alan Franklen, 5 Southam Road
Receptor 5	5 Castle Street
Receptor 6	Cheshire Court, adjacent to Warwick Road
Receptor 7	Cheshire Court, adjacent to North Bar Street
Receptor 8	Residential property above 2-3 North Bar Street

[a] Concentrations have been modelled at a height of 1.5m to represent ground level exposure, apart from at Receptors 4 and 8, where residential exposure exists at first floor (4.5m).

Impact Predictions

3.2.3 Predictions of nitrogen dioxide and PM_{10} concentrations have been carried out for a base year (2011), and a future year (2014). For 2014, predictions have been made assuming that the development does proceed (with scheme), and does not proceed (without scheme). In reality, the development will not be operational until 2016 and traffic data have been provided for a future assessment year of 2017. As such, using 2014 as the air quality assessment year is a conservative methodology and helps to ameliorate the uncertainties involved in predicting future pollutant concentrations (see Section 5.2).

[4] http://laqm.defra.gov.uk/maps/maps2008.html

3.2.4 In addition, concentrations have been predicted for 2010 at four diffusion tube monitoring locations with Banbury town centre, adjacent to roads for which traffic data are available, in order to verify the modelled results (see **Appendix C** for verification method).

3.2.5 Predictions have been carried out using the ADMS-Roads dispersion model (v3). 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 meteorological data for 2010 (consistent with the monitoring data and traffic data used for model verification) from the monitoring station located at Church Lawford, which is considered suitable for this area.

3.2.6 AADT flows, and the proportions of HDVs, for each assessment scenario have been provided by the PBA Transport team. Traffic speeds have been taken from count data, taking into account the proximity to a junction. Traffic data used in this assessment are summarised in **Appendix D**. The proposed buildings are potentially suitable for mezzanine floors. However, this would be a matter for the individual retailer to pursue through a new planning application. The Transport Assessment has taken into account the potential implications of including mezzanines, and thus the traffic data used in this assessment assume the inclusion of mezzanine floor space. The conclusions are based upon this potentially higher level of retail floor space.

3.3 Petrol Station Impacts

3.3.1 The proposals include a petrol filing station (PFS). There is the potential for emissions from the PFS to affect existing properties. The main air pollutant of concern related to the proposed PFS is benzene. PFSs can emit sufficient benzene to put the 2010 objective at risk of being exceeded, especially if combined with higher levels from nearby busy roads (Defra, 2009).

3.3.2 Defra guidance (Defra, 2009) outlines an approach to assess the potential for exceedence of the benzene objectives as a result of emissions from petrol stations. Petrol stations with an annual throughput of more than 2000m^3 of petrol (two million litres per annum), and with a busy road nearby, may result in elevated benzene concentrations. A busy road is considered to be one with a flow greater than 30,000 vehicles per day. The guidance also states that petrol stations with Stage 2 recovery systems can be ignored. Stage 2 recovery systems must be fitted to all existing petrol stations with a petrol throughput of over 3,500m^3/yr, and to all new petrol stations with a petrol throughput of over 500m^3/yr. If the petrol station meets the relevant criteria then residential properties within 10m of the pumps may be at risk of elevated benzene concentrations. Only locations which meet these criteria require further assessment. There are no existing properties within 10m of the proposed PFS, and Southam Road does not have a flow greater than 30,000 vehicles per day. Effects of emissions from the PFS are thus not considered further.

3.4 Consultation

3.4.1 The methodology used in this assessment was agreed with Cherwell DC[5].

[5] Telephone and email correspondence with Sean Gregory, 3rd - 6th January 2012

4 Existing Air Quality

4.1 LAQM

4.1.1 Cherwell DC has investigated air quality within its area as part of its responsibilities under the LAQM regime. It has recently declared an AQMA for properties alongside Hennef Way for exceedences of the annual and hourly mean nitrogen dioxide objectives. The proposed development site lies approximately 800m southwest of this AQMA. Cherwell DC has also identified the need to carry out a Detailed Assessment of air quality in the Horsefair / North Bar area of Banbury town centre, and this is currently underway.

4.2 Monitoring

4.2.1 Cherwell DC 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: Diffusion tube results 2010

Site Name	2010 Annual Mean (µg/m^3)
High Street	**43.0**
North Bar	**42.0**
Warwick Road	31.1
Southam Road	39.0
South Bar	31.7
Oxford Rd / South Bar	**43.8**
Bloxham Road	**44.9**
Horsefair / North Bar	**47.9**[a]
Objective	**40**

Raw data provided by Cherwell DC. Data have been bias adjusted by using the national bias adjustment factor (0.85, spreadsheet version 09/11). Exceedences of the objective are highlighted in bold.

[a] Concentration is the average of three co-located diffusion tubes.

4.2.2 Measured concentrations exceed or approach the annual mean nitrogen dioxide objective at most monitoring locations; Cherwell DC is currently in the process of carrying out a Detailed Assessment of air quality within this area.

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**).

Table 4.2: Estimated annual mean background concentrations in 2011 and 2014 (µg/m^3)

Year	NO_x	NO_2	PM_{10}
2011	28.4 – 41.6	18.1 – 24.6	16.2 – 17.5
2014	25.4 – 37.0	16.5 – 22.4	15.7 – 16.9
Objectives	**-**	**40**	**40**

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 receptor locations identified in **Table 3.1**. **Table 4.3** sets out the results for both the existing and future year baseline scenarios.

Table 4.3: Predicted baseline concentrations of nitrogen dioxide and PM_{10}

Receptor	NO_2		PM_{10}			
	Annual Mean (µg/m^3)		Annual Mean (µg/m^3)		Number of Days >50 µg/m^3	
	2011	2014	2011	2014	2011	2014
Receptor 1	33.9	29.6	19.4	18.6	3	2
Receptor 2	35.0	29.7	19.5	18.6	3	2
Receptor 3	38.4	32.4	20.2	19.2	4	2
Receptor 4	34.0	29.0	19.0	18.1	2	1
Receptor 5	33.1	28.3	19.1	18.2	2	2
Receptor 6	39.9	34.0	20.4	19.3	4	3
Receptor 7	**43.5**	36.9	20.8	19.7	5	3
Receptor 8	30.3	25.9	18.5	17.8	2	1
Objective	**40**	**40**	**40**	**40**	**35**	**35**

4.4.2 The predicted baseline concentrations of nitrogen dioxide are below the annual mean objective at all receptors, apart from at Receptor 7 in 2011. By 2014, concentrations are predicted to be below the annual mean objective at all receptors. There are no predicted concentrations which exceed 60 µg/m^3, and therefore there are unlikely to be any exceedences of the hourly mean objective within the study area.

4.4.3 Predicted concentrations of PM_{10} are well below the objectives at all receptors in both 2011 and 2014.

5 Impact Assessment

5.1 Road Traffic Impacts

5.1.1 Predicted concentrations of nitrogen dioxide and PM_{10} in 2014, both with and without the development in place, are presented in **Table 5.1**.

Table 5.1: Predicted Concentrations of nitrogen dioxide and PM_{10} in 2014.

Receptor	2014 Baseline			2014 With Development		
	NO_2	PM_{10}		NO_2	PM_{10}	
	Annual Mean	Annual Mean	Days	Annual Mean	Annual Mean	Days
Receptor 1	29.6	18.6	2	31.3	19.2	2
Receptor 2	29.7	18.6	2	31.9	19.4	3
Receptor 3	32.4	19.2	2	34.9	20.1	4
Receptor 4	29.0	18.1	1	30.1	18.5	2
Receptor 5	28.3	18.2	2	28.7	18.4	2
Receptor 6	34.0	19.3	3	34.6	19.5	3
Receptor 7	36.9	19.7	3	37.5	19.9	3
Receptor 8	25.9	17.8	1	26.1	17.8	1
Objectives	**40**	**40**	**35**	**40**	**40**	**35**

Annual mean ($\mu g/m^3$) and number of days >50 $\mu g/m^3$. Exceedences of the objective are highlighted in bold.

5.1.2 Predicted concentrations of nitrogen dioxide in 2014 remain below the objective, whilst PM_{10} concentrations remain well below the relevant objectives at all receptors, whether the development proceeds or not.

5.1.3 The changes in annual mean concentrations and the number of days with PM_{10} concentrations greater than 50 $\mu g/m^3$ are presented in **Table 5.2**. Based on the impact magnitude descriptors presented in **Table 2.2**, the changes in nitrogen dioxide concentrations range from imperceptible to medium, whilst the changes in PM_{10} concentrations range from imperceptible to small. Using the criteria set out in **Table 2.3**, the impacts for nitrogen dioxide are negligible to slight adverse, whilst for PM_{10} they are described as negligible at all receptors.

Table 5.2: Change in predicted concentrations brought about by the development in 2014.

Receptor	NO_2	PM_{10}	
	Annual Mean ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)	Number of Days >50 $\mu g/m^3$
Receptor 1	1.6	0.6	1
Receptor 2	2.2	0.8	1
Receptor 3	2.4	0.9	1
Receptor 4	1.1	0.3	0
Receptor 5	0.5	0.1	0
Receptor 6	0.6	0.2	0
Receptor 7	0.6	0.2	0
Receptor 8	0.2	0.1	0

Changes based on unrounded values

5.2 Uncertainty

5.2.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependant 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.

5.2.2 A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has recently been identified[6]. Whilst projections suggest that both annual mean nitrogen oxides and nitrogen dioxide concentrations 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.

5.2.3 Model uncertainty can be reduced through model verification, in which model outputs are compared with measured concentrations. The model has been verified and adjusted against 2010 monitoring data. In addition, predictions are made for an assessment year of 2014 even though the development will not be operational until 2016. Traffic data used for the assessment are based on 2017 traffic flows. This is considered to provide a worst-case assessment of concentrations, as traffic flows will be higher in 2017 than in 2014. Basing the assessment in 2014 is intended to provide a reasonable estimate of the impact of the development, taking into account the uncertainties in predicting future concentrations.

5.3 Impact Significance

5.3.1 The operational impacts of the proposed development are judged to be **insignificant**. This judgement is made in accordance with the methodology set out in paragraph 2.3.3, and takes account of the factors set out in paragraph 2.3.6, in particular that the proposed development does not give rise to any exceedences of the objectives, and brings about a negligible impact at all locations apart from at a small number of ground floor locations close to the junction of North Bar Street and Southam Road, where the impact is judged to be slight adverse.

[6] Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. Trends in NOx 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

6.1.1 The assessment has demonstrated that the proposed development would not cause any exceedences of the air quality objectives, and would at worst bring about a slight adverse impact on nitrogen dioxide concentrations adjacent to the North Bar Street / Southam Road junction. It is not considered necessary to propose further mitigation measures for this scheme.

6.1.2 A Framework Travel Plan has been prepared for the site which sets out measures to promote modal shift from private car to more sustainable forms of transport. The reductions in travel brought about by the Travel Plan have not been taken into account in the assessment, and therefore the impact of development related traffic will be smaller than that predicted.

7 Conclusions

7.1.1 The air quality impacts associated with the operation of the proposed retail development at Southam Road, Banbury have been assessed.

7.1.2 The impact of the development on air quality within Banbury town centre, where Cherwell DC is currently undertaking a Detailed Assessment of air quality, is of particular concern to the Council.

7.1.3 The impacts of development generated traffic on concentrations of nitrogen dioxide and PM_{10} have been assessed at eight receptors adjacent to the affected road network. In 2014, predicted concentrations of nitrogen dioxide and PM_{10} remain below the air quality objectives, whether the development proceeds or not.

7.1.4 The proposed development is predicted to result in an imperceptible to medium increase in nitrogen dioxide concentrations, and an imperceptible or small increase in PM_{10} concentrations. These changes are considered to be negligible impacts at all receptors, apart from at a small number of ground floor locations close to the junction of North Bar Street and Southam Road, where the nitrogen dioxide impact is judged to be slight adverse. The overall air quality impact of the development is judged to be **insignificant**. This conclusion is based on the proposed development not giving rise to any exceedences of the objectives, and resulting in a negligible increase in concentrations at all locations apart from adjacent to the junction of North Bar Street and Southam Road, and takes account of the uncertainty surrounding future year emissions.

7.1.5 The proposed development does not conflict with Local Plan Policy ENV1. In line with the draft Planning Obligations SPD, a Framework Travel Plan has been prepared for the site which will assist in mitigating the impact of development related traffic. It is concluded that the air quality impacts of development related traffic emissions do not provide any constraints to the proposed development.

Appendix A – Glossary

AADT	Annual Average Daily Traffic
AQMA	Air Quality Management Area
Diffusion Tube	A passive sampler used for collecting nitrogen dioxide 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
LDV	Light Duty Vehicle
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 nitrogen dioxide. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
PM_{10}	Small airborne particles less than 10 μm in diameter
Objective	See NAQO
Receptor	A location where the effects of pollution may occur

Appendix B – Reference List

Environmental Act 1995, Part IV.

Department of the Environment, Food and Rural Affairs 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.

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

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 2007, No. 64, The Air Quality Standards Regulations 2007, HMSO, London.

Appendix C – Verification

Model verification has been carried out using 2010 data for four diffusion tubes within Banbury town centre, which lie adjacent to roads for which traffic data are available.

Background Concentrations

Background concentrations of nitrogen dioxide and oxides of nitrogen have been taken from the national maps provided by Defra[7]. The background concentrations for the diffusion tubes in 2010 are 18.7 and 29.4 μg/m^3, respectively.

Nitrogen Dioxide

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the annual mean road-NO_x concentrations at the Southam Road, Warwick Road, North Bar and Horsefair / North Bar diffusion tubes. Concentrations have been predicted at the height of 2.5 m above ground.

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 predicted background NO_2 concentration within the NO_x from NO_2 calculator[8].

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 diffusion tube 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: 3.762

Secondary adjustment factor: 1.004

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. Two data points lie within ±10%, and all lie within ±25%.

[7] http://laqm.defra.gov.uk/maps/maps2008.html
[8] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

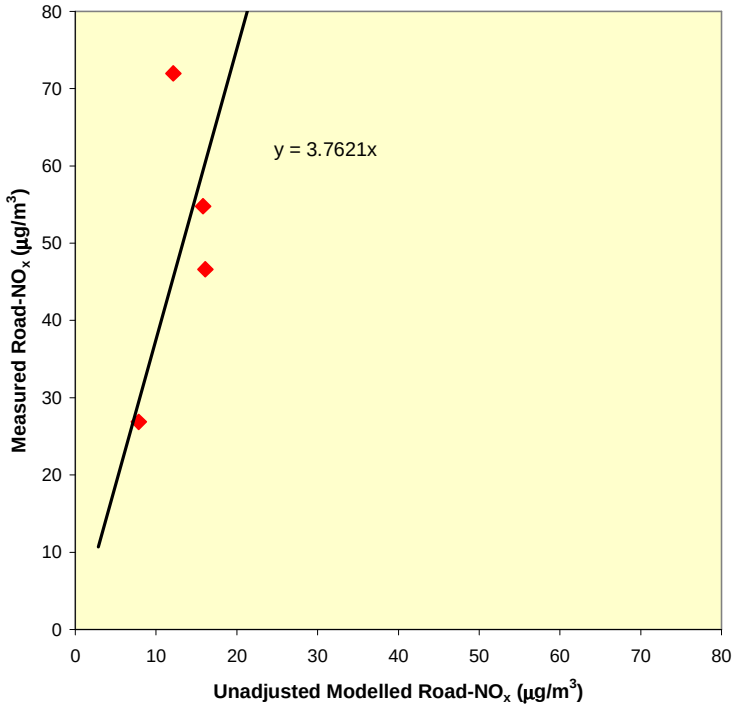


Figure C1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x Concentrations

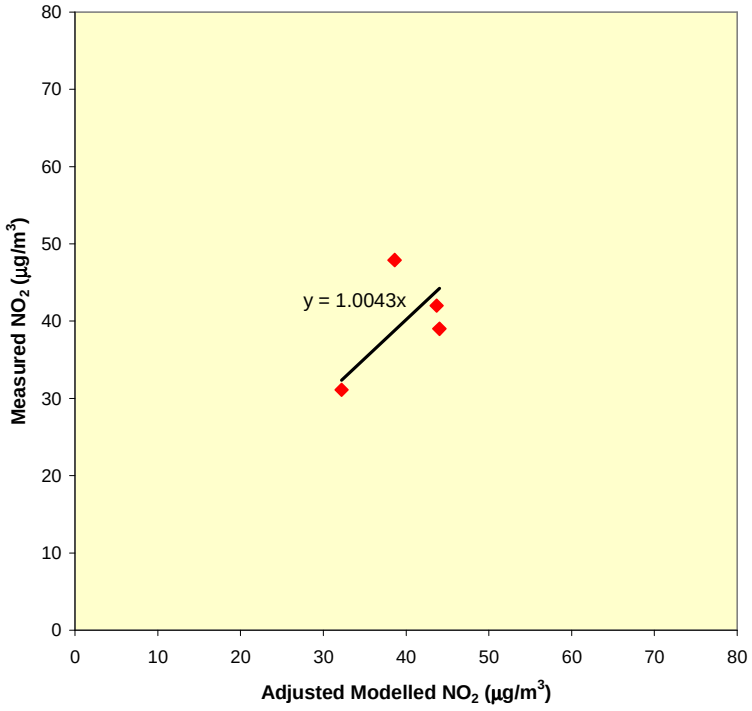


Figure C2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations

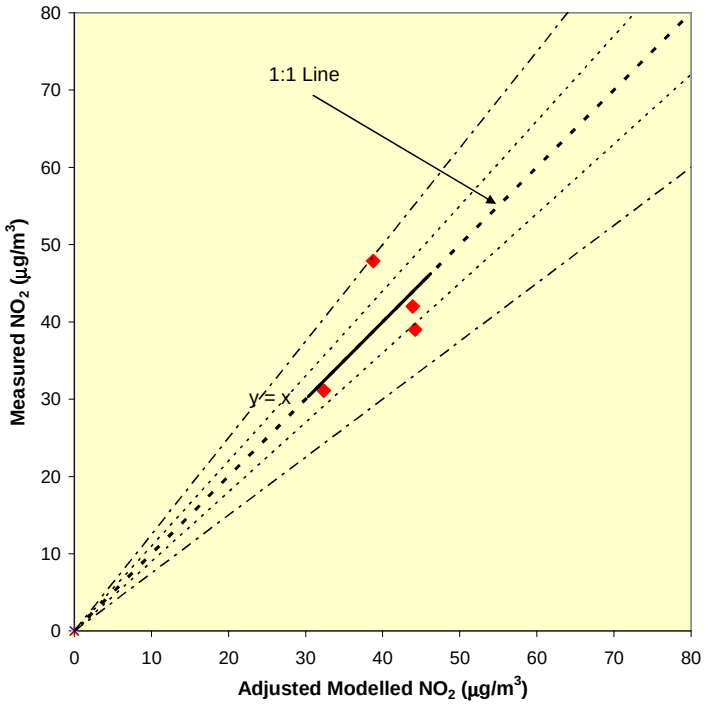


Figure C3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations

PM_{10}

There are no nearby PM_{10} monitors. It has therefore not been possible to verify the model for PM_{10}. The model outputs of road-PM_{10} have therefore been adjusted by applying the primary adjustment factor calculated for road-NO_x.

Appendix D – Traffic Data

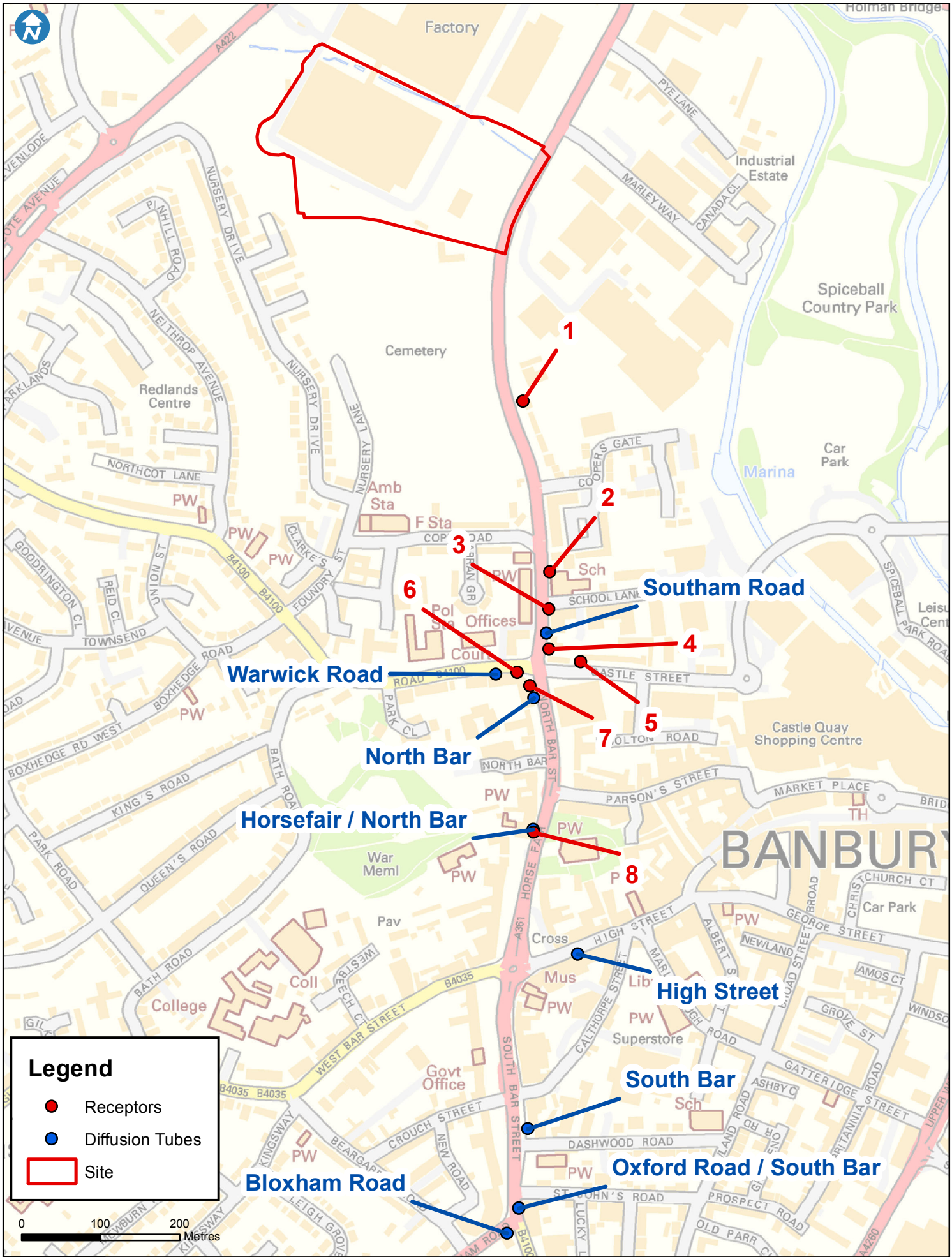
The traffic data used in the assessment are presented in **Table D1**.

Table D1: Summary of Traffic Data Used in the Assessment

Link Name	2010		2011		2017 Without Development		2017 With Development		Average Speed (kph)
	LDV	HDV	LDV	HDV	LDV	HDV	LDV	HDV	
Southam Road north of site	13,731	643	13,876	649	13,876	649	19,684	675	64.4
Southam Road south of site	13,731	643	13,876	649	13,876	649	19,102	672	64.4
North Bar Street	21,807	1,182	22,036	1,195	22,036	1,195	22,567	1,197	48.2
Warwick Road	12,009	321	12,135	324	12,135	324	12,165	325	48.2
Castle Street	11,185	314	11,302	317	11,302	317	11,388	317	48.2
Southam Road north of Warwick Road	13,270	774	13,410	783	13,410	783	18,636	805	48.2
Site Access	-	-	-	-	-	-	11,035	48	20

The proposed buildings are potentially suitable for mezzanine floors; the 'with development' traffic data assume the inclusion of mezzanine floor space.

Appendix E – Figures



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Client
Barwood Developments Ltd

Southam Road Retail, Banbury

Receptor and Monitoring Locations

Date	Jan 2012
Scale	NTS
Drawn By	DW
Checked By	RF
Figure Number	Figure 1