10 AIR QUALITY

10.1 INTRODUCTION

10.1.1 This chapter of the Environmental Statement has been produced by Arup and considers and assesses the impact of the proposed Heyford Park development on the local air quality through identification of potential direct and indirect emission sources. It outlines the current regulatory system relevant to air quality management, the baseline air quality conditions in the area and the methodology used to assess air quality impacts. Potential changes to air quality, as a result of the development proposals, have been considered in relation to the UK Government's Air Quality Strategy objectives to determine their significance. Where appropriate, mitigation measures are outlined to ensure any adverse effects on air quality are minimised or avoided.

10.2 REGULATORY FRAMEWORK

The Land use Planning Process

10.2.1 The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land use and its development can be a material planning consideration in the determination of planning applications, dependent upon the details of the proposed development.

National Planning Policy

10.2.2 Planning policies particularly relevant to air quality are set out in PPG13[1] - Transport and PPS23 – Planning and Pollution Control[2], and in the Local Air Quality Management guidance note on Air Quality and Land Use Planning[3].

PPS23: Planning and Pollution Control (2004)

10.2.3 PPS23: Planning and Pollution Control PPS23 (2004) is intended to complement the new pollution control framework under the Pollution Prevention and Control Act 1999 and The Pollution Prevention and Control (England and Wales) Regulations 2000. PPS23 sets out the Government's core policies and principles on pollution and land use planning. It contains an Annex on 'Pollution Control, Air and Water Quality' which considers the links between the land use planning and pollution control systems and how the interaction should be dealt with in planning. Policies and advice contained within PPS23 (including Annexes) should be taken into account in preparing policies relevant to potentially polluting sites by Regional Planning Bodies, Regional Spatial Strategies and Local Planning Authorities and in determining applications for planning permission. PPS23 also makes reference to proposed development within designated Air Quality Management Areas (AQMAs). It states that whilst it is important that the possible impact on air quality to or in an AQMA are considered, it is not the case that all planning applications for development inside or adjacent to AQMAs

should be refused if the developments would result in a deterioration of local air quality as this could sterilise development.

PPG13: Transport (2001)

10.2.4 A revised version of PPG13 (Transport) was published in March 2001, updating the Government's transport planning policies, with the objectives of delivering an integrated transport policy, extending transport choices and securing mobility in a way that supports sustainable development. The aim is to integrate planning and transport at a number of levels to promote more sustainable transport choices (for people and freight), to promote accessibility to services and to reduce the need to travel, especially by car. PPG13 states that local air quality is a key consideration in the integration between planning and transport. This is particularly relevant in areas where the Government's national air quality objectives are not expected to be met and air quality action plans are formulated. The PPG advises that well designed traffic management measures are able to contribute to reducing local air pollution and improving the quality of local neighbourhoods.

Local Air Quality Management Policy Guidance LAQM.PG(03)

10.2.5 Policy guidance note LAQM.PG(03) provides additional guidance on the links between transport and air quality. PG(03) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

10.2.6 LAQM.PG(03) also provides guidance on the links between air quality and the land use planning system. The guidance advises that air quality considerations would be integrated within the planning process at the earliest stage, and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality generally. It summarises the main ways in which the land use planning system can help deliver air quality objectives.

National Society for Clean Air (NSCA) Guidance – Development Control: Planning for Air Quality

10.2.7 The revised 2006 NSCA guidance note 'Development Control: Planning for Air Quality'[4] responds to the need for closer integration between air quality and development control. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

10.2.8 The guidance shown in Figure AQ.01 includes an approach for assessing the significance of the impacts of development proposals in terms of air quality and how to make recommendations relevant to the development control process in light of this assessment. The need for early and effective dialogue between the developer and Local Authority is identified to allow air quality concerns to be addressed as early in the development control process as possible. The guidance also provides some clarification as to when air quality

constitutes a material consideration. The approach for assessing the significance of air quality impacts associated with a given development has been used in this assessment, and is outlined in section 10.3

Regional Planning Policy

10.2.9 Relevant regional planning policy for the South East is contained in Regional Planning Guidance (RPG9).

Regional Planning Guidance for the South East

10.2.10 The Regional Planning Guidance for the South East[5] was published by the Secretary of State for Environment, Transport and the Regions in March 2001. The document sets out a broad development strategy for the South East up to 2016. One of the underlying aims of the strategy is to protect and enhance the environmental quality of the region, including air quality, as set out in Policy E7 of Chapter 6: Environmental Strategy and the Countryside. This policy states:

"Local authorities should work with the Environment Agency and others to play a positive part in pollution control and encourage measures to improve air quality.

a) Development plans should:

- *i include policies on the location of potentially polluting developments and the location of sensitive developments in the vicinity of existing polluting developments in line with guidance PPG23 (Planning and Pollution Control);*
- *ii take account of the findings of air quality reviews and assessments; and*
- *iii take into account any Air Quality Management Areas (AQMAs) designated under Part IV of the Environmental Act 1995 and any AQMA action plans.*

b) In addition, local authorities should:

- *i ensure at the planning application stage, that air quality is taken into account where appropriate along with other material considerations;*
- *ii seek to reduce environmental impacts of transport activities by supporting the increased provision of cleaner transport fuels such as liquefied petroleum gas (LPG) and compressed natural gas (CNG), for example, by enabling the development of refuelling infrastructure; and*
- *iii work in partnership taking steps to achieve an integrated approach to air quality management."*

10.2.11 The South East Plan is a new type of planning document, which was submitted to Government on 31 March 2006. The examination period ran from 28 November 2006 to 30 March 2007 and the panel's report was due at the end of August 2007. Consultation on the proposed changes are then expected in early 2008, with the revised document publication planned for the autumn.

Local Planning Policy

Cherwell Local Plan

10.2.12 The Cherwell Local Plan (adopted November 1996) remains part of the statutory Development Plan for the area. It contains broad strategic planning functions for the collective area. The draft Cherwell Local Plan 2011, now re-titled as the "Non-Statutory Cherwell Local Plan 2011" was due to be introduced as a replacement for the Local Plan, however work on this was discontinued in December 2004 to begin work on the Local

Development Framework (LDF) under the Planning and Compulsory Purchase Act 2004. As work on the LDF is still on-going, many of the most up-to-date policies are present in the Non-Statutory document.

10.2.13 The most pertinent policy in terms of air quality is contained in Chapter 9. Conserving and Enhancing the Environment; Policy EN5: Air Pollution, which states:

> *"In determining planning applications, the council will have regard to the likely impact of the development on air quality as a result of its operational characteristics and the traffic generated by it. Development which would have a significant adverse impact on air quality will not be permitted, wherever possible the council will seek to improve air quality through the control of development."*

Air Quality Objectives and Limit Values

10.2.14 Air quality limit values and objectives are quality standards for clean air. They can be used as assessment criteria for determining the significance of any potential changes in local air quality resulting from the proposed development.

10.2.15 European Union (EU) air quality policy sets the scene for national policy. The EU air quality 'framework' Directive on Ambient Air Quality Assessment and Management came into force in September 1996 and is intended as a strategic framework for tackling air quality consistently, through setting European-wide air quality limit values in a series of daughter directives, superseding and extending existing European legislation. The first four daughter directives have already been placed into national legislation.

10.2.16 In a parallel national process, the Environment Act was published in 1995. The Act required the preparation of a national air quality strategy setting air quality standards and objectives for specified pollutants and outlining measures to be taken by local authorities (through the system of Local Air Quality Management ('LAQM')) and by others *'to work in pursuit of the achievement'* of these objectives. *A National Air Quality Strategy* (NAQS) was published in 1997 and subsequently reviewed and revised in 2000, as the *Air Quality Strategy for England, Scotland, Wales and Northern Ireland*[6] and an addendum to the Strategy was published in 2003[7]. The current *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* has just recently been published in July 2007[8]. The objectives which were relevant to local air quality management were set in regulations (Air Quality Regulations 2000 and 2002), and have since been updated into the *Air Quality Standards Regulations 2007*[9].

10.2.17 Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24 hour, one hour or 15 minute average concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations (e.g. nitrogen dioxide and fine particulate matter).

10.2.18 Table AQ.01 sets out the EU air quality limit values and national air quality objectives for the main pollutants relevant to this study.

Table AQ01: UK Air Quality Objectives and EU Limit Values for NO_2 and PM_{10}				
Pollutant	**Averaging Period**	**Objective/ Limit Value**	**Compliance Date**	**Basis**
Nitrogen dioxide (NO2)	1 hour mean	200 µg/m3 (105ppb), not to be exceeded more than 18 times a year (99.8th percentile)	31st Dec 2005	National
			1st Jan 2010*	EU
	Annual mean	40 µg/m3	31st Dec 2005	National
			1st Jan 2010*	EU
Fine particulate matter (PM_{10})	24 hour mean	50 µg/m3, not to be exceeded more than 35 times a year (90th percentile)	31st Dec 2004	National
			1st Jan 2005* (Stage 1)	EU
Measurement technique:Gravimetric	Annual mean	40 µg/m3	31st Dec 2004	National
			1st Jan 2005*(Stage 1)	EU

*Changes have been proposed but are not yet included in the regulations

10.2.19 Performance against these objectives is monitored where people are regularly present and might be exposed to air pollution, and it is the responsibility of each Local Authority to undertake such duties. Each Local Authority is required to undertake a review and assessment of local air quality. The process considers the current air quality situation and the likely future air quality situation, assessing whether the prescribed objectives are likely to be achieved by their target dates.

10.3 ASSESSMENT APPROACH

Terms of Reference

10.3.1 The main elements of the proposed development relevant to local air quality are emissions from the following sources:

- Demolition and construction activities, including construction-related traffic; and,
- Traffic related to the operation of the proposed development (operational traffic), i.e. traffic travelling to and from the proposed new development.

The air quality assessment of the proposed development comprises:

- A review of existing air quality in the area;
- Assessment of the potential changes in air quality arising from the construction and operation of the proposed development;

- Formulation of mitigation measures, where appropriate, to ensure that any adverse effects on air quality are minimised; and,
- Identification of likely residual effects, following application of the outlined mitigation measures.

Methodology

Review of Air Quality Situation

10.3.2 The existing air quality situation has been reviewed through data available from Cherwell District Council's air quality assessment documents.

Construction Assessment Approach

10.3.3 Construction effects have been assessed through a qualitative assessment of potential sources of air pollutant emissions from construction activities and through the formulation of appropriate mitigation and control measures to be placed within a formal Code of Construction Practice (CoCP).

10.3.4 The GLA London Best Practice Guide[10] has also been used, which consolidates existing guidance on emissions from construction and demolition activities and takes into account the latest best practice and new techniques. It also requires the site manager or contractors to undertake a qualitative Air Quality Impact Evaluation, whereby the site is evaluated and mitigation measures are proposed based on the outcome. This is further discussed in section 10.5

Operational Assessment Approach

10.3.5 Operational air quality impacts from road traffic related to the new development proposals have been assessed using a detailed air dispersion model, CALINE4. This model updates the CALINE3 model, which is recommended for use by the US Environmental Protection Agency to predict air pollutant concentrations near roadways at discrete receptors. Predicted pollutant concentrations from the modelling have then been compared with the relevant air quality standards and objectives. The pollutants assessed were nitrogen dioxide (NO2) and fine particulate matter (PM10); as these were identified through consultation with the Environmental Health Officer (E.H.O.) at Cherwell District Council as being the principal pollutants of concern.

10.3.6 Pollutant concentrations have been forecast using CALINE4, as described above, which calculates one-hour mean pollutant concentrations, based on a variety of inputs (as detailed below).

10.3.7 Pollutant concentrations have been forecast for the following scenarios:

- The baseline (existing) development traffic scenario of 2006;
- The 2013 'Do Minimum' opening year scenario without the proposed development in place; and,
- The 2013 'Do Something' opening year scenario with the proposed development in place.

The results of the dispersion modelling have been compared to the appropriate standards and guidelines.

CALINE4 Model Input data

10.3.8 The CALINE4 air dispersion model requires the following input data:

- Traffic data (vehicle flows, average speeds and percentage of heavy goods vehicles);

- Vehicle exhaust emission rates;
- Background pollutant concentrations; and,
- Meteorological data.

Further details on each of these inputs are described below.

Traffic Data and Assumptions

10.3.9 Information on local traffic flows has been obtained from Arup Transport Planning through automatic traffic count (ATC) data and traffic modelling. The ATC data was available for the road network in the vicinity of the development.

10.3.10 The traffic data consisted of 24 hour annual average daily flows (AADT), average speeds and percentages of heavy goods vehicles (HGVs) on the local network, and included generated flows in relation to the new development for each of the future assessment scenarios.

10.3.11 The CALINE4 dispersion model requires roads to be split into a series of links, which represent sections where traffic conditions are reasonably homogenous in regard to flow and average speed.

Pollutant Emission Rates

10.3.12 For the detailed modelling, a network of links was developed which represented vehicle movements on the local road system. Pollutant emission rates from vehicles were calculated using emission data provided in the Design Manual for Roads and Bridges (DMRB)[11], using vehicle speeds and percentage of heavy goods vehicles on each link, along with the relevant assessment years (2006 and 2013).

10.3.13 It is important to ensure the correct assessment year is selected when calculating emission rates, as they are forecast to reduce with time due to improvements in vehicle emission control technologies and legislative requirements.

Receptor Locations

10.3.14 Pollutant concentrations have been forecast at selected properties (from hereon, referred to as receptors), where exposure of residents to atmospheric emissions from road traffic is potentially the greatest. Pollutant concentrations decrease significantly with distance from a road source and, provided that there are no other major sources in the vicinity, concentrations are lower than at properties located further away from the receptors chosen.

10.3.15 Seven receptors were selected for this assessment positioned over a large study area at the request of the E.H.O. at Cherwell D.C., with each of these receptors being a property in closest proximity to primary access routes affected by the development. Front facades of the properties were taken as the receptor points. Table AQ.02 details the receptor locations in this assessment, which are further shown in section 10.5 and illustrated in Figure AQ.02

Table AQ.02: Receptors Locations Surrounding the Site		
Receptor Number	**Receptor Location / Grid Reference**	**Description**
1)	GP Surgery / (446970, 228656)	Surgery
2)	Hopcroft Holt Hotel / (446541, 225112)	Hotel
3)	Dovecote Farm / (449801, 228691)	Residential Property
4)	134 Freehold Road / (449227, 224753)	Residential Property
5)	4 Dow Street / (451186, 225745)	Residential Property
6)	1 Ardley Fields Farm Cottages / (453996, 226377)	Residential Property
7)	Corner Cottage / (453439, 223487)	Residential Property

Background Pollutant Concentrations

10.3.16 The modelling procedure requires that emissions from sources other than road vehicles are taken into account. Consequently, values for the background pollutant concentrations are required. Long-term (annual) mean background concentrations are available on the National Air Quality Archive[12]. For this assessment, the relevant values were added to the predicted model results to determine whether the air quality objectives and limit values are likely to be met.

10.3.17 The background concentrations for the receptors surrounding the development site are presented in section 10.4

Met Data

10.3.18 Meteorological files comprising sequential hourly meteorological data for 2003 to 2005 from RAF Brize Norton meteorological station were used in the model at the request of the E.H.O. at Cherwell D.C. Meteorological files from RAF Upper Heyford were initially requested; however the data from Brize Norton was more up-to-date. These sets of data are required to assess the pollutant concentrations over the various time periods defined by the air quality objectives (i.e. 1 hour, 24 hour and annual means).

10.3.19 The model was run using all three years of meteorological data, in order to provide the worst-case prediction of pollutant concentrations for all of the scenario models. In this assessment, the results showed that 2003 was the worst-case meteorological year.

Model Data Processing and Road Network

10.3.20 The detailed dispersion modelling results have been processed to calculate the percentile values and averaging periods required.

10.3.21 NO_x emissions from combustion sources (including vehicle exhausts) comprise principally nitric oxide (NO) and a small percentage of nitrogen dioxide (NO_2). The emitted nitric oxide reacts with oxidants in the air (mainly ozone) to form more nitrogen dioxide. Since only nitrogen dioxide is associated with effects on human health, the air quality standards for the protection of human health are based on NO_2 and not total NO_x or NO. A suitable NO_x: NO_2 conversion needs to be applied to the modelled NO_x concentrations.

10.3.22 There are a variety of different approaches to dealing with NO_x: NO_2 relationships and Government guidance indicates that the use of any of these is acceptable[13]. The method applied to the annual mean NO_x in this study is the new approach by Air Quality Consultants Ltd, based on monitoring data from 2003 - 2006, to allow for the increase in the primary NO_2 from traffic[14]. The update supersedes the original conversion, issued as part of the current Technical Guidance, LAQM.TG(03). Since then, evidence has emerged that the proportion of primary NO_2 in vehicle exhaust has increased and the relationship between NO_x and NO_2 at the roadside has changed.

10.3.23 To obtain the hourly mean NO2 concentrations the Derwent-Middleton correlation[15] was applied to the hourly mean NO_x concentrations.

Significance Criteria

10.3.24 The updated NSCA guidance provides further clarification on how to describe the significance of the impacts predicted from the air quality modelling, specifically for the pollutants NO_2 and PM_{10}.

10.3.25 Two tables are presented that set out examples of descriptors for magnitude of change and significance (as shown below in Tables AQ.03 and AQ.04). The first step is to identify the descriptor of change in ambient concentrations for NO_2 and PM_{10} (Table AQ.03) according to the percentage change in annual mean concentrations (for both NO_2 and PM_{10}) and change in the forecast number of days greater than 50µg/m3 for PM10. The descriptor can then be used to assess the impact significance for the two pollutants in relation to changes in the absolute concentration forecast from the modelling with the proposed development in place (Table AQ.04).

Table AQ.03: Descriptors for Changes in Ambient Concentrations of Nitrogen Dioxide and PM_{10}

Magnitude of Change	Annual Mean NO_2 / PM_{10}	Days PM_{10}>50 µg/m^3
Very large	Increase/decrease > 25%	Increase/decrease > 25 days
Large	Increase/decrease 15-25%	Increase/decrease 15 -25 days
Medium	Increase/decrease 10-15%	Increase/decrease 10-15 days
Small	Increase/decrease 5-10%	Increase/decrease 5-10 days
Very small	Increase/decrease 1-5%	Increase/decrease 1-5 days
Extremely small	Increase/decrease < 1%	Increase/decrease < 1 day

Source: Taken from the NSCA 2006 guidance update

Table AQ.04: Descriptors for Impact Significance for Nitrogen Dioxide and PM_{10}						
Air Quality Impact Significance Criteria						
Absolute Concentration in Relation to Standard	**Extremely Small**	**Very Small**	**Small**	**Medium**	**Large**	**Very Large**
Decrease with scheme						
Above Standard with scheme	Slight beneficial	Slight beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Above Standard without scheme Below with scheme	Slight beneficial	Moderate beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Below Standard without scheme, but not Well Below	Negligible	Slight beneficial	Slight beneficial	Moderate beneficial	Moderate beneficial	Substantial beneficial
Well Below Standard without scheme	Negligible	Negligible	Slight beneficial	Slight beneficial	Slight beneficial	Moderate beneficial
Increase with scheme						
Above Standard without scheme	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard without scheme Above with scheme	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard with scheme, but not Well Below	Negligible	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well Below Standard with scheme	Negligible	Negligible	Slight adverse	Slight adverse	Slight adverse	Moderate adverse
Well Below standard = <75% of the standard level. 'Standard' in the context of this table relates to specific air quality objective or Limit Value in question						

Source: Taken from the NSCA 2006 guidance update

10.4 BASELINE CONDITIONS

10.4.1 Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment – these are present from various sources, such as industrial processes, commercial and domestic activities, agriculture, traffic and natural sources. This section describes the existing ambient air quality situation in the area of the proposed development.

The following data sources have been employed in this assessment:

- Air Quality Updating and Screening Assessment for Cherwell, Cherwell District Council, January 2007;
- National Air Quality Archive; and,
- Environment Agency website.

Air Pollution Sources

Industrial Processes

10.4.2 Industrial air pollution sources are regulated through a system of operating permits and authorisations, which require stringent emission limits to be met in order to ensure that any releases to the atmosphere are minimised or rendered harmless.

10.4.3 Regulated (or prescribed) industrial processes are classified as Part A or Part B processes. Part A processes regulated through the Integrated Pollution Prevention and Control (IPPC) system[16] fall into two categories – Part A1 processes which are regulated by the Environment Agency and Part A2 processes which are regulated by the Local Authorities. Part A processes have the potential for release of prescribed substances to air, land and water, and as such require an IPPC permit to operate.

10.4.4 Part B processes are those regulated by the Local Authority through the Pollution Prevention and Control (PPC) system under the Pollution Prevention and Control (England and Wales) Regulations 2000. Part B processes are smaller in scale than Part A processes and have the potential for release of prescribed substances to air only, requiring a PPC authorisation or permit to operate.

10.4.5 There are currently 6 Part A processes and 59 Part B processes in operation within Cherwell District[17], of which there are no Part A and 2 Part B processes in the vicinity of the proposed development, both of the latter situated in Heyford Park itself and carry out coating activities.

10.4.6 Given that the atmospheric releases of Part A and B processes are strictly regulated, they are not expected to significantly impact the ambient air quality at the proposed development site.

Road Traffic

10.4.7 Emissions from road traffic are recognised to be a major contributor to poor air quality. In recent decades, transport atmospheric emissions, on a national basis, have grown to match or exceed other sources in respect of many pollutants, particularly in urban areas. In the area surrounding the site of the proposed development, vehicle emissions are therefore likely to be the dominant source of air pollutants. The principal pollutants (produced as a result of traffic emissions) that have been identified as being of most concern by the UK Government's Air Quality Strategy (AQS) and in Highways Agency guidance are:

- Nitrogen dioxide (NO_2);
- Fine particulate matter (PM_{10});
- Carbon monoxide (CO); and,
- Volatile Organic Compounds (VOCs), especially benzene and 1,3-butadiene.

10.4.8 Consultation with the Environmental Health Officer (E.H.O.) at Cherwell District Council however, concluded that the main pollutants of concern in the district are NO_2 and PM_{10}. This study therefore, only focuses on these two air pollutants, which are emitted by vehicular traffic.

Local Authority Review and Assessment

10.4.9 Cherwell District Council has been appraising its air quality through a review and assessment process involving assessment of current, and likely future air quality, against the seven key pollutants for Local Air Quality Management as required by the Environment Act 1995.

10.4.10 Where air quality objectives are predicted to be exceeded, local authorities are legally required to declare Air Quality Management Areas (AQMAs) covering at the very least predicted areas of exceedance.

10.4.11 The findings of the first stage of Cherwell District Council's review and assessment report in 1999, the Stage 2 report (2000), the Updating and Screening Assessment (2004) and the Progress Report (2005), all concluded that the air quality limits and objectives across the District were likely to be met at all monitoring locations and that no AQMAs needed to be declared.

10.4.12 An Updating and Screening Assessment has just been conducted as part of the third round of the review and assessment process. This concluded that a Detailed Review and Assessment is not required for any of the seven key pollutants and as such, no AQMAs need to be declared.

Ambient Air Quality Monitoring

10.4.13 The Updating and Screening Assessment (2007) details monitoring of nitrogen dioxide (NO_2) concentrations at 15 sites across the District through the use of diffusion tubes, however none of these sites are within the vicinity of the proposed development. The monitoring of fine particulate matter (PM_{10}) is not conducted by Cherwell District Council.

Background Pollutant Concentrations

10.4.14 The National Air Quality Archive provides estimates of background air quality parameters for 2004 for nitrogen oxides (NO_x), nitrogen dioxide (NO_2) and fine particulates (PM10) with projections for future years. Estimated concentrations of the three pollutants for national grid squares surrounding the proposed development site are presented below in Table AQ.05.

Table AQ.05: Background Pollutant Concentrations used in Modelling around the Site

Reference Area	Pollutant	Year	
		2006	2013
Receptor 1. Grid Reference: - 446500, 228500	Nitrogen oxides, NO_x ($\mu g/m^3$)	11.54	8.90
	Nitrogen dioxide, NO_2 ($\mu g/m^3$)	9.18	7.22
	Fine particulate matter, PM_{10} ($\mu g/m^3$)	18.82	17.39

Table AQ.05: Background Pollutant Concentrations used in Modelling around the Site			
Reference Area	**Pollutant**	**Year**	
		2006	**2013**
Receptor 2. Grid Reference: -446500, 225500	Nitrogen oxides, NO_x (µg/m^3)	11.54	8.94
	Nitrogen dioxide, NO_2 (µg/m^3)	9.21	7.26
	Fine particulate matter, PM_{10} (µg/m^3)	18.82	17.10
Receptor 3. Grid Reference: -449500, 228500	Nitrogen oxides, NO_x (µg/m^3)	12.03	9.32
	Nitrogen dioxide, NO_2 (µg/m^3)	9.55	7.53
	Fine particulate matter, PM_{10} (µg/m^3)	18.82	16.81
Receptor 4. Grid Reference: -449500, 224500	Nitrogen oxides, NO_x (µg/m^3)	11.26	8.74
	Nitrogen dioxide, NO_2 (µg/m^3)	8.96	7.09
	Fine particulate matter, PM_{10} (µg/m^3)	18.82	16.71
Receptor 5. Grid Reference: -451500, 225500	Nitrogen oxides, NO_x (µg/m^3)	12.51	9.59
	Nitrogen dioxide, NO_2 (µg/m^3)	9.96	7.80
	Fine particulate matter, PM_{10} (µg/m^3)	18.72	17.01
Receptor 6. Grid Reference: -453500, 226500	Nitrogen oxides, NO_x (µg/m^3)	23.86	17.16
	Nitrogen dioxide, NO_2 (µg/m^3)	18.26	15.28
	Fine particulate matter, PM_{10} (µg/m^3)	20.42	18.36
Receptor 7. Grid Reference: -453500, 223500	Nitrogen oxides, NO_x (µg/m^3)	24.34	17.44
	Nitrogen dioxide, NO_2 (µg/m^3)	18.55	15.47
	Fine particulate matter, PM_{10} (µg/m^3)	21.82	19.62

10.5 IMPACT ASSESSMENT

Construction Impacts

10.5.1 Atmospheric emissions from construction activities would depend on a combination of the potential for emission (the type of activities) and the effectiveness of control measures. In general terms, there are two sources of emissions that would need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and,
- Fugitive dust emissions from site activities – including demolition and construction dust.

Exhaust Emission Impacts

10.5.2 The operation of vehicles and equipment powered by internal combustion engines, results in the emission of exhaust gases containing the pollutants NO_x, PM_{10}, VOCs, and CO. The quantities emitted depend on factors such as engine type, service history, pattern of usage and composition of fuel. The operation of site equipment, vehicles and machinery would result in emission to the atmosphere of un-quantified levels of waste exhaust gases but such emissions are unlikely to be significant, particularly in comparison to levels of similar emissions from road traffic.

10.5.3 The traffic effects of the construction of the proposed development would be along the traffic routes employed by haulage vehicles, construction vehicles and employees. The principal construction activities with transportation implications are:

- Removal of surplus materials from any demolition or excavation work;
- Delivery of materials for new development and construction; and
- Movement of heavy plant.

10.5.4 Entry to the construction site for labour and vehicles would be by dedicated access points only. Construction traffic could have an impact on adjoining occupiers if not properly controlled but mitigation measures would be able to reduce these impacts.

Fugitive Dust Impacts

10.5.5 Fugitive dust emissions from demolition and construction activities are likely to be variable and would depend upon type and extent of the activity, soil conditions (soil type and moisture) road surface condition and weather conditions. Soils are inevitably drier during the summer period and periods of dry weather combined with higher than average winds have the potential to generate the most dust. The construction activities that are the most significant potential sources of fugitive emissions are:

- Demolition activities, due to the breaking up and size reduction of concrete, stone and compacted aggregates;
- Earth moving, due to the excavation, handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement powder and sand);
- Movement of heavy site vehicles on dry, untreated or hard surfaced surfaces; and,
- Movement of vehicles over surfaces contaminated by muddy materials brought off the site - for example, over public roads.

10.5.6 Fugitive dust arising from construction activities is generally of particle size greater than the human health-based PM10 fraction. In assessing the impact of fugitive dust there are two different effects that need to be considered: the effects on human health and dust nuisance. The former relates to the concentration of dust in suspension in the atmosphere and the latter relates to the amount of dust falling onto and soiling surfaces (or rate of dust deposition). If not effectively controlled, fugitive dust emissions can lead to dust nuisance. Most of the dust emitting activities outlined above respond well to appropriate dust control/mitigation measures and adverse effects can be greatly reduced or eliminated.

10.5.7 The sensitivity of different land uses and facilities to dust can be categorised from low to high. The dust sensitive properties within the vicinity of the proposed development are primarily medium sensitivity facilities,

as although the surrounding area is sparsely populated rural land, the immediate surrounding is primarily a residential area.

10.5.8 The dust sensitive properties within the vicinity of proposed development are existing residential properties on the site, parallel to Camp Road and also properties along the dedicated haulage routes.

10.5.9 Dust dispersion and deposition patterns can vary widely depending on prevailing weather conditions. Wind speed is an important factor in the dispersal distance of dust emissions, while wind direction is crucial for determining where the dust concentrations may impact. Given that the prevailing wind direction is from the south west, it is the area to the north east of the site that is more likely to suffer dust nuisance.

10.5.10 Airborne dust has a limited ability to remain airborne and readily drops from suspension as a deposit. Research undertaken for the United States Environmental Protection Agency (US EPA)[18] concluded that large particulate matter (particles over 30 mm in diameter), return to the surface quite rapidly. Under average wind conditions (mean wind speed of 2-6 m/sec), these particles, which comprise around 95% of total dust emissions were found to return to the surface within 60-90 m of the emission source[19].

10.5.11 The GLA London Best Practice Guide partnership document provides guidance for the control of dust and emissions from construction and demolition activities. This is a London focussed document to provide consistent best practice for demolition and construction sites across London, although the principles of best practice are equally applicable to other areas outside London. The guide has a dual role in providing guidance to developers as well as providing Local Authorities with standards against which to evaluate best practicable means. One particular aspect of the guidance is that it requires site managers or contractors to undertake an Air Quality Impact Evaluation. Depending on the outcome of the assessment (high, medium or low risk), mitigation measures are then proposed to control the air quality effects of construction or demolition, as detailed below in Table AQ.06.

Table AQ.06: Site Evaluation Guidelines (Adapted from the Best Practice Guidance, The control of Dust and Emissions from Construction and Demolition).
Low risk sites
▪ Development of up to 1,000 square metres of land and; ▪ Development of up to one property and up to a maximum of ten and; ▪ Potential for emissions and dust to have an infrequent impact on sensitive receptors.
Medium risk sites
▪ Development of between 1,000 and 15,000 square metres of land and; ▪ Development of between 10 to 150 properties and; ▪ Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.

Table AQ.06: Site Evaluation Guidelines (Adapted from the Best Practice Guidance, The control of Dust and Emissions from Construction and Demolition).
High risk sites
▪ Development of over 15,000 square metres of land, or: ▪ Development of over 150 properties or; ▪ Major Development referred to the Mayor/ and or the London Development Agency, or; ▪ Major development defined by a London borough (or local planning authority) or; ▪ Potential for emissions and dust to have significant impact on sensitive receptors.

Operational Impacts

10.5.12 The effects of traffic movements on local air quality, in the vicinity of the proposed development have been assessed using the modelling approach in section 10.3

Predicted Pollutant Concentrations

10.5.13 The forecast concentrations of pollutants from CALINE detailed modelling for the years 2006 and 2013, with all modelled scenarios are presented in Table AQ.07 below for comparison to relevant air quality standards and objectives.

Nitrogen dioxide

10.5.14 The forecast annual mean nitrogen dioxide (NO_2) concentrations at all 7 receptor locations surrounding the proposed development are all within the national and EU annual mean objectives for all scenarios modelled. Forecast concentrations decrease between 2006 and 2013 due to expected improvements in vehicle emission control technologies and a reduction in background concentrations.

10.5.15 The largest increases in concentration are forecast at No.1 Ardley Fields Farm Cottages (Receptor 6) and Dovecote Farm (Receptor 3), with predicted concentrations to be 22.2µg/m3 – 23.2µg/m3 and 14.2µg/m3 – 15.2µg/m3 respectively, for the 'Do-Minimum' and 'Do-Something' scenarios in the opening year of 2013.

10.5.16 The largest increase in the hourly concentration is forecast at Dovecote Farm (Receptor 3), with predicted concentrations to be 55.6µg/m3 – 59.9µg/m3 for the 'Do-Minimum' and 'Do-Something' scenarios in the opening year of 2013. These concentrations are well within the national and EU hourly mean objectives.

10.5.17 5 receptors experience a small increase in hourly pollutant concentrations between the scenarios however; the remaining 2 receptors experience an improvement in hourly concentrations. The same 5 receptor locations are predicted to experience a small increase in the annual mean concentrations also, however the remaining 2 locations experiencing no change. All of these concentrations are still a reduction from those predicted concentrations in the baseline year of 2006.

Fine particulate matter

10.5.18 The annual mean fine particulate matter (PM_{10}) concentrations are predicted to be well within the national and EU objectives across all receptors for all modelled scenarios. Only 3 of the receptors are predicted to experience an increase in PM_{10} concentrations, all of 0.1µg/m3; with the remaining receptors predicted to experience no change.

10.5.19 Predictions of the absolute daily average PM_{10} concentrations are very complex since a wide variety of sources must be taken into account and these sources behave in different ways. Therefore, it is difficult to compare the forecast 35th highest daily mean to the objectives due to a lack of suitable background values. However, the results in Table AQ.07 enable the contribution of the proposed development to daily average PM_{10} concentrations to be considered.

Table AQ.07 Summary of Predicted Concentrations for Modelled Receptors

	Nitrogen dioxide		**Fine particulate matter**	
Objective / Value	**Annual Mean**	**Hourly Mean**	**Annual Mean**	**Days>50 µg/m³**
	µg/m³	**µg/m³**	**µg/m³**	
National	**40**	**200**	**40**	**35**
EU	**40 by 2010**	**200 by 2010**	**20 by 2010**	**35 by 2010**
Receptor 1: GP Surgery				
2006 Baseline	14.3	60.2	19.3	1.01
2013 Do-Minimum	11.0	52.0	17.7	0.63
2013 Do-Something	11.4	53.7	17.7	0.63
Receptor 2: Hopcroft Holt Hotel				
2006 Baseline	20.2	78.2	20.1	2.00
2013 Do-Minimum	15.6	71.9	17.9	1.24
2013 Do-Something	15.6	71.4	17.9	1.24
Receptor 3: Dovecote Farm				
2006 Baseline	18.0	63.7	19.7	1.42
2013 Do-Minimum	14.2	55.6	17.4	0.89
2013 Do-Something	15.2	59.9	17.5	0.89
Receptor 4: 134 Freehold Street				
2006 Baseline	15.2	64.4	19.5	1.23

Table AQ.07 Summary of Predicted Concentrations for Modelled Receptors				
	Nitrogen dioxide		Fine particulate matter	
Objective / Value	Annual Mean	Hourly Mean	Annual Mean	Days>50 µg/m³
	µg/m³	µg/m³	µg/m³	
2013 Do-Minimum	11.6	54.7	17.1	0.74
2013 Do-Something	11.6	54.2	17.1	0.74
Receptor 5: 4 Dow Street				
2006 Baseline	14.0	48.1	19.2	0.69
2013 Do-Minimum	10.8	39.4	17.3	0.42
2013 Do-Something	11.1	41.7	17.3	0.42
Receptor 6: 1 Ardley Fields Farm Cottage				
2006 Baseline	27.5	68.2	21.4	1.51
2013 Do-Minimum	22.2	59.3	19.0	1.00
2013 Do-Something	23.2	62.0	19.1	1.00
Receptor 7: Corner Cottage				
2006 Baseline	27.8	72.4	23.0	2.02
2013 Do-Minimum	22.8	64.2	20.3	1.23
2013 Do-Something	23.4	66.8	20.4	1.23

10.6 SIGNIFICANCE OF PREDICTED IMPACTS

Construction Impacts

10.6.1 According to the site evaluation guidelines described in section 10.5, the proposed development has been classified as a high risk site. This is due to the large number of properties involved and the potential for emissions and dust to have a significant impact on sensitive receptors, particularly those residential properties adjacent to Camp Road who are closest to the main site access. However, the Best Practice Guidance notes that the implementation of the suggested mitigation measures will help reduce the impact of the construction activities to medium or even low risk. Proposed mitigation measures are further discussed in section 10.7

Operational Impacts

10.6.2 As is evident from the results in section 10.5, and Tables AQ.03, AQ04 and AQ.07; negligible impacts are predicted as a result of the proposed development. Therefore, according to NSCA guidance 4 and the flow chart in Figure AQ.01, the following can be noted:

- Modelling shows that the proposed development does not lead to a breach of the national objectives or EU limit values for either pollutant or cause a new AQMA to be declared;
- The proposed development will not interfere with or prevent the implementation of the actions within any Air Quality Action Plan;
- It is not anticipated that the proposed development would interfere with the implementation of a local air quality strategy; and,
- The scheme will not lead to a significant increase in emissions.

10.6.3 Based on this, it is therefore considered that in the case of the proposed Heyford Park development, air quality would be a low priority consideration.

10.7 IMPACT MITIGATION

Construction Phase Mitigation Measures

10.7.1 Most of the dust emitting activities outlined above respond well to appropriate dust control/mitigation measures and adverse effects can be greatly reduced or eliminated. Effective dust mitigation measures prevent dust becoming airborne or contain dust within enclosures to prevent dispersion beyond the emission source.

10.7.2 Prior to commencement of construction activities, a Code of Construction Practice (CoCP), will be agreed with the Cherwell District Council to ensure the potential for adverse environmental effects on local receptors is avoided. This will include traffic routing, site access points and hours of operation. The following air quality mitigation measures, for controlling dust and general pollution nuisance from the site construction operations, reflect what is expected to be included in the CoCP, taking into account the Best Practice Guidance for a high risk site as identified in section 10.5:

- Erect solid barriers to site boundary, where appropriate;
- No bonfires on site;
- Plan site layout by locating dust activity away from sensitive receptors;
- All site personnel to be fully trained;
- Trained and responsible manager on site during working times to carry out inspections;
- Hard surface site haul routes with regular cleaning of site entrance roads;
- Damping down of site haul roads during prolonged dry periods;
- Wheel washing facilities to prevent mud from construction operations being transported on to adjacent public roads;
- Confinement of vehicles to designated haul routes within the site;
- Restricting vehicle speeds on haul roads and other un-surfaced areas of the site;
- Ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials);
- Ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage is away from site boundaries, water sprays are used where practicable to reduce dust emissions);
- Site planning to carry put main dust causing activity in spring/autumn;
- Provide hard standing areas for vehicles and regularly inspect and clean these areas;
- Re-vegetate earthworks and exposed areas;
- Minimise dust generating activities on windy and dry days;
- Appropriate dust site monitoring is included within the site management practices to inform site management of the success of dust control measures used; and,
- Ensuring that local residents are informed in advance of any particularly dusty activities, to promote communication and the principle of advanced notice.

10.7.3 Thus the construction activities would be controlled to reduce, as far as practicable, the potential environmental impacts, thus limiting residual impacts.

10.7.4 Implementation of the suggested mitigation measures above will help reduce the impact of the construction activities to medium to low risk.

10.7.5 Overall, construction effects on air quality would be minimised through the implementation of mitigation measures through the CoCP. This would significantly reduce the amount of dust that escapes from the site boundary and where construction activities are in very close proximity to sensitive receptors, additional dust control measures may be employed. Any construction effects on air quality would be temporary and reversible.

Operational Phase Mitigation Measures

10.7.6 No mitigation measures in relation to the operation of the development are proposed.

10.8 RESIDUAL EFFECTS

10.8.1 With suitable mitigation measures in place, any adverse effects on local air quality from construction are expected to be relatively short-term and temporary. No long-term residual effects are expected as a result of the construction of the proposed development.

10.8.2 In accordance with the NSCA criteria set out in Figure AQ.01, it has been determined that the operation of the proposed development should be given a low priority consideration as the increase in forecast concentrations, are well within the UK objectives and EU limit values.

10.9 DISCUSSION & CONCLUSION

10.9.1 An assessment has been carried out to determine the potential impacts on air quality as a result of the construction and operational phases of the proposed Heyford Park development.

10.9.2 The assessment examines the existing air quality in the area and then predicts the magnitude and significance of the likely effect on air quality as a result of increases in local traffic composition, from the operation of the proposed development.

10.9.3 The main potential air quality impact during the works phase of the development would be from the emission of dust. If released in sufficient quantities, this could result in significant nuisance from soiling at the large number of nearby properties. Dust emissions from site would, however, be controlled using mitigation measures detailed in an approved Code of Construction Practice (CoCP) with Cherwell District Council that would ensure that the potential adverse impacts are minimised or avoided.

10.9.4 A detailed assessment has been used to predict the changes in air quality as a result of the traffic flow changes on the road network surrounding the development. These have been produced for the baseline 2006 situation and forecast for the opening year of 2013, both with and without the proposed development in place. This

modelling has shown that a negligible deterioration in local air quality is predicted at all receptors locations, however for some pollutants there is no predicted change in the concentration.

10.9.5 Overall, no significant effects on local air quality are predicted to result from the proposed development. The assessment has demonstrated that the environmental risk in terms of air quality associated with the construction will be high, however with appropriate mitigation this will be reduced to a medium/low risk. The impacts during operation, following the NSCA guidance, will be negligible. Additionally, air quality should have a low priority consideration in the planning process.

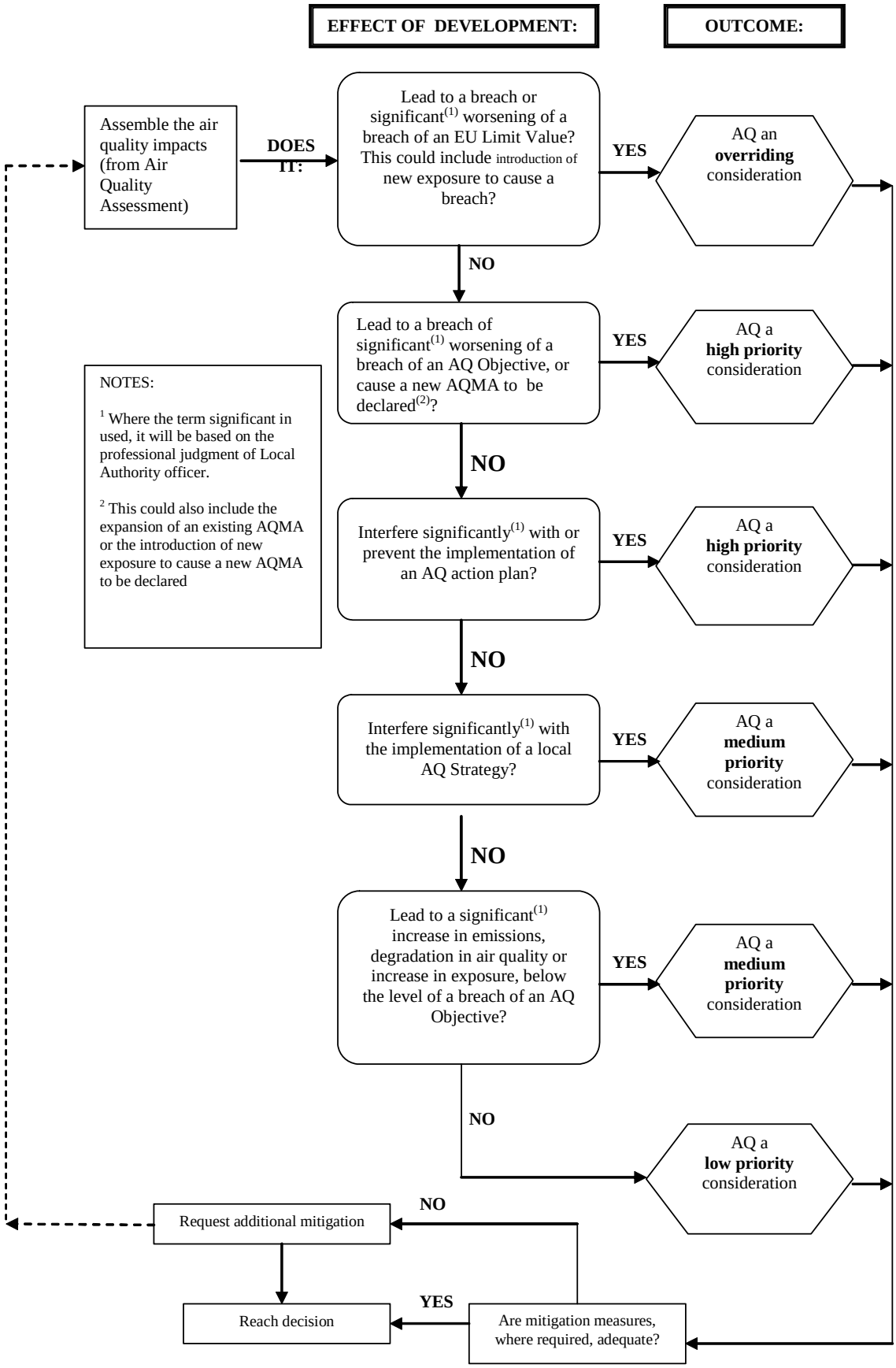

Figure AQ.01: Assessment Of Significance Of Air Quality Impacts

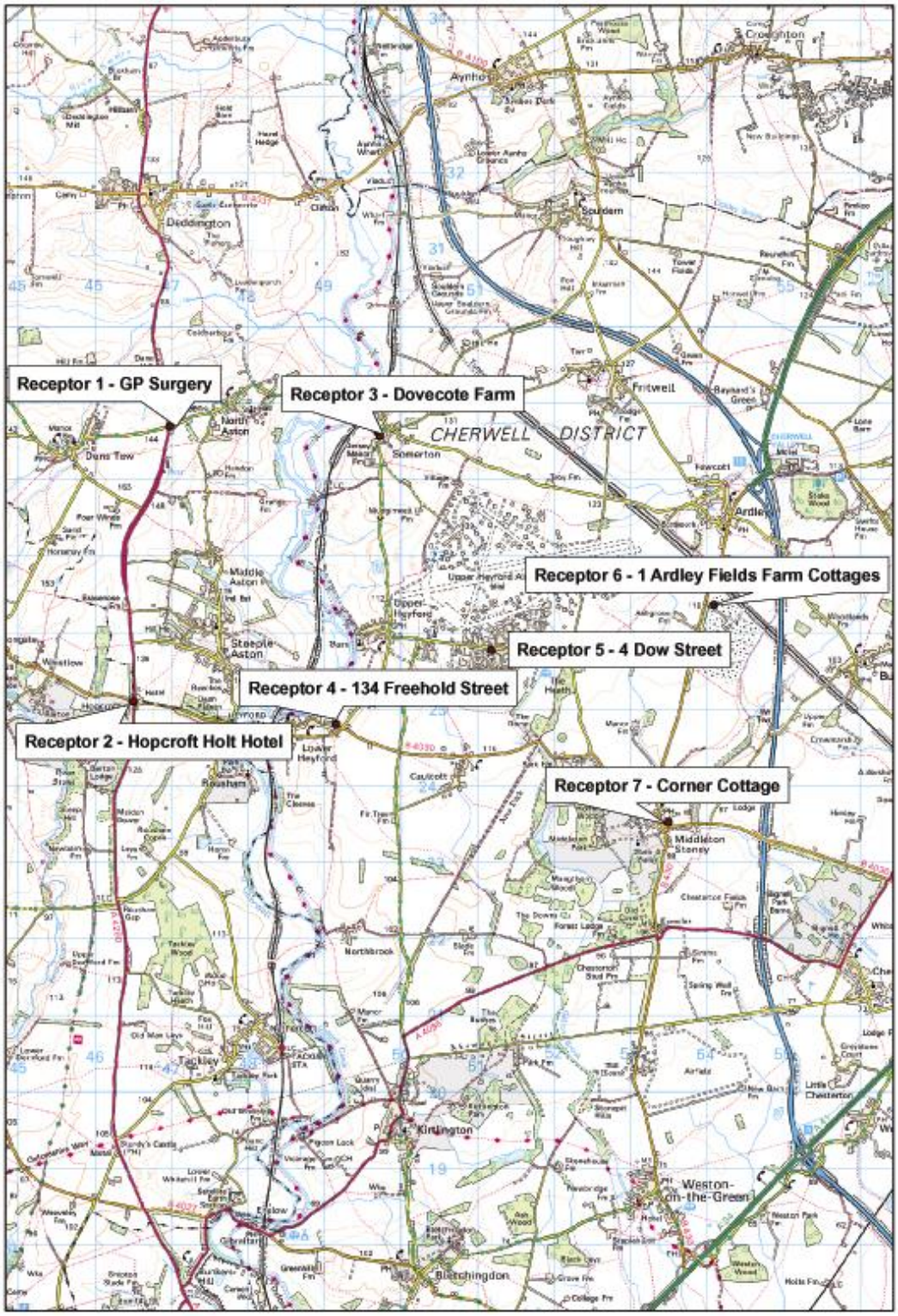

Figure AQ.02: Receptor Locations

NOTES

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