**CONTENTS**

## 6.1 INTRODUCTION

6.1.1 This Chapter of the ES, prepared by Wardell Armstrong LLP, assesses the potential air quality effects of the Proposed Development. A qualitative assessment has been undertaken to assess the potential air quality impacts of dust arising from the construction phase of works and impacts from construction traffic. Air dispersion modelling, using ADMS-Roads, has also been carried out to assess the potential air quality impacts of development generated traffic.

6.1.2 This Chapter should be read in conjunction with Section Chapter 2 of the ES, which gives details of the Site location and development works to be undertaken at the Site.

6.1.3 A glossary of the key terminology used within this chapter can be found in appendix 6.1.

## 6.2 ASSESSMENT METHODOLOGY

### Scope

6.2.1 The air quality assessment includes assessments for both the construction and operational phases of the Proposed Development.

*Existing Dust Sensitive Receptors – Human Receptors*

6.2.2 The closest sensitive human receptor locations to the Proposed Development are residential and educational in nature, and are detailed in Table 6.1.

**Table 6.1 – Existing Dust Sensitive Receptors: Human**

| Receptor | Direction from the Site | Approximate Distance from the Site Boundary |
|---|---|---|
| Residential properties along Foxwood Close, Leawood Close and Jaynes Close | North | 10m at closest points (i.e. 4 Foxwood Close, 5 Leawood Close and 4 Jaynes Close) |
| Residential properties along Lansdown Close | North | 65m at closest point (i.e. 19 Lansdown Close) |
| Banbury School | North | 57m |
| Residential properties along Grange Road | North and North East | 35m at closest point (i.e. 102 Grange Road) |
| Residential properties along Waller Drive | North West | 134m at closest point (i.e. 1 Waller Drive) |
| 1 and 2 Crouch Cottages, Bloxham Road | West | 20m |
| The Lodge, Bloxham Road | West | 7m |
| The Bungalow, Bloxham Road | West | 141m |
| Wykham Farm Cottages | South | 12m |
| Stone Barn, Wykham Park Farm | South | 79m |
| Wykham Farm, Georges Barn and The Great Barn | South | 105m at closest point (i.e. The Great Barn) |
| Residential properties along Wykham Lane including: Holly Lodge, Safine House, Todd Cottage and Leylands | South and South East | 328m at closest point (i.e. Holly Lodge) |

*Existing Dust Sensitive Receptors – Ecological Receptors*

6.2.3 There are also ecological receptors within 50m of the Site and / or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the Site entrance(s).

6.2.4 The proposed Salt Way Local Wildlife Site (LWS) runs from Broughton Road near Bretch LWS (located approximately 1.2km to the north west of the Site) to the junction with bridleway 45 (near Grange Road). Therefore approximately half of the potential LWS defines much of the northern Site boundary of the Proposed Development. It has a surface path lined either side with a wide strip of mature tree line/hedgerow and scrub.

*Existing Sensitive Receptors – Human Receptors (Operational Phase)*

6.2.5 Representative existing sensitive receptor locations (identified as ESR 1 to ESR 11) have been considered in the air quality assessment. The existing sensitive receptor locations have been selected along those routes most likely to be affected by the Proposed Development. Details of the existing sensitive receptor locations are shown in appendix 6.2 and detailed in Table 6.2.

**Table 6.2 - Existing Sensitive Receptor Locations**

| Receptor | Address | Grid Reference | | Type of Receptor |
|---|---|---|---|---|
| | | Easting | Northing | |
| ESR 1 | The Bungalow, Bloxham Road | 444005 | 238378 | Residential |
| ESR 2 | 2 Crouch Cottages, Bloxham Road | 444173 | 238753 | Residential |
| ESR 3 | 2 Lansdown Close | 444525 | 239099 | Residential |
| ESR 4 | 123 Bloxham Road | 444963 | 239543 | Residential |
| ESR 5 | 9 Oxford Road | 445342 | 240081 | Residential |
| ESR 6 | 1 Gables Court, Oxford Road | 445400 | 239840 | Residential |
| ESR 7 | 85 Bloxham Road | 445040 | 239738 | Residential Care Home |
| ESR 8 | 8 Oxford Road | 445319 | 240068 | Residential |
| ESR 9 | 130 Oxford Road | 445571 | 239360 | Residential |
| ESR 10 | 38 Peoples Place, Warwick Road | 445350 | 240743 | Residential |
| ESR 11 | 2 Horse Fair | 445350 | 240579 | Residential |

*Proposed Sensitive Receptors – Human Receptors (Operational Phase)*

6.2.6 Proposed sensitive receptor locations (identified as PR 1 to PR 3) have been selected within the Site at locations considered representative of the proposed residential areas.

6.2.7 Pollutant concentrations have been predicted for Scenarios 3 and 4 (as detailed in paragraph 6.2.34). It is only necessary to consider the 'with development' scenarios for proposed receptor locations as they will not experience any 'without development' conditions. It is not therefore necessary to consider the changes in pollutant concentrations at the proposed receptor locations.

6.2.8 The proposed sensitive receptor locations, considered in this assessment, are detailed in Table 6.3 and shown in appendix 6.2.

**Table 6.3 - Proposed Sensitive Receptor Locations**

| Receptor Point | Location | Grid Reference | |
|---|---|---|---|
| | | Easting | Northing |
| PR 1 | Location considered representative of the proposed residential areas closest to the A361 Bloxham Road and the proposed Site access; in the western part of the Site | 444277 | 238777 |
| PR 2 | Location considered representative of the proposed residential areas closest to the proposed Site access; in the western part of the Site | 444275 | 238734 |
| PR 3 | Location considered representative of the proposed residential areas closest to the A361 Bloxham Road; in the north western part of the Site | 444322 | 238852 |

*Existing Sensitive Receptors – Ecological Receptors (Operational Phase)*

6.2.9 Guidance detailed within the Design Manual for Roads and Bridges guidance document: Volume 11, Section 3 – Environmental Assessment, Environmental Assessment Techniques (2007) states that:

6.2.10 "The designated sites that should be considered for assessment are those for which the designated features are sensitive to air pollution, either directly or indirectly, and which could be adversely affected by the effect of local air pollution on vegetation within the following nature conservation sites: SAC (SCI or cSAC), SPA, pSPA, SSSI and Ramsar sites."

6.2.11 The potential LWS, located within close proximity to the Proposed Development, has not been given any of the above designations. Therefore, it is considered that an assessment of the operational impacts of the Proposed Development on the LWS is not required.

**Data sources**

6.2.12 The following sources of information have been used in the preparation of this report:

- Part IV Environment Act, Chapter 25, Air Quality, 1995;
- DEFRA, The UK National Air Quality Strategy, March 1997;
- The Air Quality Standards Regulations 2010;
- Department for Communities and Local Government, National Planning Policy Framework (NPPF), published March 2012;
- Department for the Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(09), published February 2009;
- Environment Protection UK (EPUK) Development Control: Planning for Air Quality (2010 Update), 2010;
- Institute of Air Quality Management (IAQM) guidance: 'Guidance on the Assessment of Dust from Demolition and Construction, published February 2014;
- Cherwell District Council, Air Quality Detailed Assessment – Hennef Way, Banbury, 2010;
- Ricardo-AEA, Further Assessment of Air Quality at Hennef Way, 2013;
- Cherwell District Council, Air Quality Progress Report, 2014; and
- Traffic flow information, provided by Jubb Consulting Engineers Limited (detailed in Appendix 6.3).

**Assessment Approach**

*Construction Phase – Construction Traffic*

6.2.13 Detailed traffic flow information for the construction phase of the development is not available at this stage and therefore it is not possible to undertake a quantitative

assessment of the impact of these additional vehicles at existing sensitive receptor locations.

6.2.14 Construction traffic will access the Site via the proposed Site access from the A361 Bloxham Road. Given the existing high volume of traffic travelling along Bloxham Road, the number of additional vehicles associated with the construction phase of the development is not considered to be significant and are not considered further within this chapter.

*Construction Phase Assessment – Dust Emissions*

6.2.15 To assess the impacts associated with dust and $PM_{10}$ releases, during the construction phase of the development, an assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (February 2014).

6.2.16 At this stage, detailed information regarding the exact itinerary of the construction phase is not available. More information regarding this will be provided once a contractor has been appointed.

*Step 1*

6.2.17 Step 1 of the assessment is to screen the requirement for a more detailed assessment (i.e. Step 2). The guidance states that an assessment will normally be required where there are existing human sensitive receptors within 350m of the Site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the Site entrance(s).

6.2.18 With regard to ecological receptors, the guidance states that an assessment will normally be required where there are existing ecological receptors within 50m of the Site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the Site entrance(s).

6.2.19 If there are existing sensitive receptor locations within 350m of the Site boundary, it is necessary to proceed to Step 2 of the assessment.

6.2.20 The exact route of the construction vehicles is not known at this stage. There are however existing sensitive receptors located within 350m of the Site boundary. It is therefore, necessary to proceed to Step 2 of the assessment.

*Step 2*

6.2.21 Step 2 of the assessment determines the potential risk of dust arising in sufficient quantities to cause annoyance, health effects and/or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the Site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

6.2.22 The risk of dust effects is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon two factors:

- **Step 2A** – the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large; and
- **Step 2B** – the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

6.2.23 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

6.2.24 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout

*Step 3*

6.2.25 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[1], recommended for use outside the capital by LAQM guidance, and the IAQM 'guidance document itself. If the risk is classed as negligible, no mitigation measures, beyond those required by legislation, will be necessary.

*Step 4*

6.2.26 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

*Operational Phase Assessment – Road Traffic Emissions*

*Modelling of Road Traffic Emissions*

6.2.27 The air dispersion model ADMS-Roads has been used to assess the potential impact of development generated traffic on local air quality at existing receptor locations. In addition, pollutant concentrations have also been predicted at the proposed sensitive areas of the development (i.e. at locations representative of the proposed residential dwellings).

6.2.28 The air dispersion model has been used to predict nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$) concentrations, as these are the pollutants most likely to exceed the air quality objectives.

[1] Greater London Authority (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance

6.2.29 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for two assessment years as follows:

- The verification and base year (2013): This is the most recent year for which traffic flow information, local monitored pollution data and meteorological data are available; and
- An appropriate future year: This is considered both without the development and with the development in place and for the purposes of this air quality assessment is assumed to be 2022.

*Road Traffic Data*

6.2.30 The ADMS-Roads model requires the input of detailed road traffic flow information for those routes which will be affected by the Proposed Development. The traffic flow information used in the assessment is included in Appendix 6.3.

6.2.31 Detailed traffic flow information, for use in the ADMS-Roads air dispersion model, has been obtained from Jubb Consulting Engineers Limited, the appointed transport consultant for the Proposed Development.

6.2.32 Traffic flow information has been provided by the transport consultant as 24 hour Annual Average Daily Traffic (AADT) flows, with HGV percentages, for the following links:

- A361 Bloxham Road;
- A4260 Oxford Road;
- A361 Horsefair / North Bar Street;
- A4269 Concord Avenue;
- A422 Hennef Way;
- Queensway;
- Springfield Avenue; and
- Proposed Site access from Bloxham Road.

6.2.33 The traffic flow information takes into consideration the following committed development:

- Land East of Bloxham Road Scheme – 145 dwellings (12/00080/OUT).

6.2.34 The traffic flow information for the cumulative impact assessment also takes into consideration the following proposed development:

- Barwood Scheme – 400 dwellings (14/01188).

6.2.35 Air quality modelling has been carried out to predict pollutant concentrations, due to road traffic emissions, for a total of four scenarios:

- Scenario 1: 2013 Verification and Base Year;
- Scenario 2: 2022 Future Assessment Year, Without Development (i.e. Future Baseline + Land East of Bloxham Road Scheme Committed Development Traffic); and
- Scenario 3: 2022 Future Assessment Year, With Development (i.e. Future Baseline + Land East of Bloxham Road Scheme Committed Development Traffic + Application Development Traffic).
- Scenario 4: 2022 Future Assessment Year, With Development (i.e. Future Baseline + Horgan Scheme Committed Development Traffic + Barwood Scheme Proposed Development Traffic + Application Development Traffic).

*Meteorological Data*

6.2.36 The meteorological data used in the air quality modelling has been provided by ADM Limited. Meteorological data has been obtained for 2013 from the Church Lawford recording station.

6.2.37 The Church Lawford station is located approximately 35km from the Site. This recording station is considered to be the most representative of the conditions at the Site due to its location relative to the Site and similar altitude. The meteorological data provides hourly wind speed and direction information. The 2013 wind rose for Church Lawford is included in Appendix 6.4.

*Model Validation, Verification and Adjustment*

6.2.38 Defra Local Air Quality Management Technical Guidance, 2009, (LAQM.TG(09)) recognises that model validation generally refers to detailed studies that have been carried out by the model supplier or a regulatory agency. The ADMS-Roads model has been validated by the supplier CERC.

6.2.39 Model verification is required to check the performance of the model at a local level. The verification of the ADMS-Roads model has been achieved by modelling concentrations at existing monitoring locations and comparing the modelled concentrations with the measured concentrations.

6.2.40 As there is no roadside continuous analyser, located along the routes adjacent to the Site, bias-adjusted monitoring data from five representative diffusion tube locations has been used.

6.2.41 All five diffusion tubes were located 1m or more from the closest kerb and are therefore classed as roadside locations, in accordance with LAQM.TG(09).

6.2.42 The diffusion tube on South Bar had less than 75% data capture for 2013. The decision was taken to remove this monitoring location from the verification procedure as another monitoring location, with 100% data capture, was available very close by (i.e. Oxford Road / South Bar monitoring location).

6.2.43 $NO_2$ measurement data from 2013 has been used for the purposes of verification, as this is the most recent year for which bias-adjusted data is available. The monitoring data that has been used in the model verification procedure is detailed in Table 6.4.

**Table 6.4 - 2013 Diffusion Tube Data, $NO_2$**

| Site Name | Grid Reference | | $NO_2$ Annual Average with Bias Correction Applied* (2013) |
|---|---|---|---|
| | X | Y | |
| Oxford Road | 445581 | 239365 | 39.40 |
| North Bar | 445352 | 240744 | 39.60 |
| Oxford Road / South Bar | 445335 | 240094 | 39.90 |
| Bloxham Road | 445316 | 240069 | 41.80 |
| Horsefair | 445351 | 240578 | 42.20 |

6.2.44 It has not been possible to carry out verification for $PM_{10}$ concentrations as monitoring data is not available in the vicinity of the Site.

6.2.45 Further details of the model verification procedure are included in Appendix 6.5. Uncorrected and corrected pollutant concentrations are included in Appendices 6.6 and 6.7, respectively.

**Significance Criteria**

*Construction Phase Assessment – Dust Emissions*

6.2.46 The Institute of Air Quality Management (IAQM) guidance document 'Guidance on the Assessment of Dust from Demolition and Construction '(February 2014) details criteria for assessing the sensitivity of an area to dust soiling effects, health effects of $PM_{10}$ and ecological effects, as summarised in Tables 6.5 to 6.9 below.

6.2.47 The guidance then goes on to provide significance criteria for the classification of dust effects from demolition, earthworks, construction activities and trackout, as summarised in Tables 6.10 to 6.12 below.

*Sensitivity of the Area for Human Receptors*

6.2.48 The sensitivity categories for different types of receptors, to both dust soiling effects and health effects of $PM_{10}$, are described in Table 6.5.

**Table 6.5: Sensitivity Categories for Human Receptors**

| Sensitivity Category | Dust Soiling Effects | Health effects of $PM_{10}$ |
|---|---|---|
| **High** | Users can reasonably expect to enjoy a high level of amenity;<br>Appearance, aesthetics or value of a property would be diminished;<br>Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms. | Locations where member of the public are exposed over a period of time relevant to the air quality objective for $PM_{10}$;<br>Examples include residential properties, hospitals, schools and residential care homes. |
| **Medium** | Users would expect to enjoy a reasonable level of amenity as in their home;<br>The appearance, aesthetics or value of their property could be diminished;<br>People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time;<br>Examples include parks and places of work. | Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for $PM_{10;}$<br>Examples include office and shop workers but will generally not include workers occupationally exposed to $PM_{10}$. |
| **Low** | Enjoyment of amenity would not reasonably be expected;<br>Property would not be diminished in appearance, aesthetics or value;<br>People or property would be expected to be present only for limited periods of time;<br>Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads. | Locations where human exposure is transient;<br>Examples include public footpaths, playing fields, parks and shopping streets. |

6.2.49 Based upon the category of receptor sensitivity, the sensitivity of the area to dust soiling effects is determined using the criteria detailed in Table 6.6.

**Table 6.6 Sensitivity of the Area to Dust Soiling Effects on People and Property**

| Receptor Sensitivity | Number of Receptors | Distance from Source (m) | | | |
|---|---|---|---|---|---|
| | | <20m | <50m | <100m | <350m |
| **High** | >100 | High | High | Medium | Low |
| | 10-100 | High | Medium | Low | Low |
| | 1-10 | Medium | Low | Low | Low |
| **Medium** | >1 | Medium | Low | Low | Low |
| **Low** | >1 | Low | Low | Low | Low |

6.2.50 Based upon the category of receptor sensitivity, the sensitivity of the area to the health effects of $PM_{10}$ is determined using the criteria detailed in Table 6.7.

**Table 6.7: Sensitivity of the Area to Human Health Impacts**

| Receptor Sensitivity | Annual Mean $PM_{10}$ Concentration | Number of Receptors | Distance from Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | <20m | <50m | <100m | <200m | <350m |
| High | >32µg/m$^3$ | >100 | High | High | High | Medium | Low |
| | | 10-100 | High | High | Medium | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 28-32µg/m$^3$ | >100 | High | High | Medium | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 24-28µg/m$^3$ | >100 | High | Medium | Low | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | <24µg/m$^3$ | >100 | Medium | Low | Low | Low | Low |
| | | 10-100 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Medium | - | >10 | High | Medium | Low | Low | Low |
| | - | 1-10 | Medium | Low | Low | Low | Low |
| Low | - | >1 | Low | Low | Low | Low | Low |

*Sensitivity of the Area for Ecological Receptors*

6.2.51 Dust deposition has the potential to affect sensitive habitat and plant communities in two ways: physical and chemical. Direct physical effects include smothering, which can lead to reduced photosynthesis or transpiration. Chemical effects relate to changes in soils or watercourses, such as increased acidity.

6.2.52 The sensitivity categories for different types of receptors to ecological effects are described in Table 6.8.

**Table 6.8: Sensitivity Categories for Ecological Receptors**

| **Sensitivity Category** | |
|---|---|
| **High** | Locations with an international or national designation and the designated features may be affected by dust soiling;<br>Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain;<br>Indicative examples include a Special Area of Conservation (SAC) designated for acid heath lands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings. |
| **Medium** | Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;<br>Locations with a national designation where the features may be affected by dust deposition;<br>An indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features. |
| **Low** | Locations with a local designation where the features may be affected by dust deposition;<br>An indicative example is a Local Nature Reserve (LNR) with dust sensitive features. |

6.2.53 Based upon the category of receptor sensitivity, the sensitivity of the area to ecological effects is determined using the criteria detailed in Table 6.9.

**Table 6.9: Sensitivity of the Area to Ecological Effects**

| **Receptor Sensitivity** | **Distance from Source (m)** | |
|---|---|---|
| | **<20m** | **<50m** |
| **High** | High | Medium |
| **Medium** | Medium | Low |
| **Low** | Low | Low |

*Risk of Dust Impacts*

6.2.54 The risk of dust being generated by demolition activities at the Site is determined using the criteria is Table 6.10.

**Table 6.10: Risk of Dust Impacts – Demolition**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| **High** | High Risk | Medium Risk | Medium Risk |
| **Medium** | High Risk | Medium Risk | Low Risk |
| **Low** | Medium Risk | Low Risk | Negligible |

6.2.55 The risk of dust being generated by earthworks and construction activities at the Site is determined using the criteria in Table 6.11.

**Table 6.11: Risk of Dust Impacts – Earthworks and Construction**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| **High** | High Risk | Medium Risk | Low Risk |
| **Medium** | Medium Risk | Medium Risk | Low Risk |
| **Low** | Low Risk | Low Risk | Negligible |

6.2.56 The risk of dust being generated by trackout from the Site is determined using the criteria in Table 6.12.

**Table 6.12: Risk of Dust Impacts - Trackout**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Medium** | **Medium** | **Small** |
| **High** | High Risk | Medium Risk | Low Risk |
| **Medium** | Medium Risk | Low Risk | Negligible |
| **Low** | Low Risk | Low Risk | Negligible |

*O*

*Operational Phase Assessment – Road Traffic Emissions*

*Air Quality Significance Criteria*

6.2.57 In order to assess the significance of the impact of the operational phase of the Proposed Development on local air quality, significance criteria have been used for $NO_2$ and $PM_{10}$. These criteria are detailed in Tables 6.13 and 6.14. The criteria relate to $NO_2$ and $PM_{10}$ only, as these are the pollutants most likely to exceed the air quality objectives. The criteria are taken from Environmental Protection UK (EPUK) document 'Development Control: Planning for Air Quality (2010 Update)'.

6.2.58 The impact magnitude and impact descriptors in relation to specific objectives for annual mean $NO_2$ and $PM_{10}$ concentrations are detailed in Table 6.13.

**Table 6.13 - Definition of Impact Magnitude for Changes in Annual Mean $NO_2$ and $PM_{10}$ Concentration**

| Magnitude of change | Annual Mean |
|---|---|
| Large | Increase/decrease >4µg/m$^3$ |
| Medium | Increase/decrease 2-4µg/m$^3$ |
| Small | Increase/decrease 0.4-2µg/m$^3$ |
| Imperceptible | Increase/decrease <0.4µg/m$^3$ |

6.2.59 The EPUK document indicates that when describing an air quality impact at a specific receptor, the actual concentration at the receptor should be taken into account, in combination with the magnitude of change, using the approach detailed in Table 6.14. This approach is appropriate for the assessment of annual mean concentrations of $NO_2$ and $PM_{10}$ in England, i.e. where the objective concentration is 40µg/m$^3$.

**Table 6.14 - Air Quality Impact Descriptors for Changes to Annual Mean $NO_2$ and $PM_{10}$ Concentrations at a Receptor**

| Absolute concentration in relation to objective / limit value | Change in concentration* | | |
|---|---|---|---|
| | Small | Medium | Large |
| Increase with scheme | | | |
| Above objective/limit value with scheme (>40µg/m$^3$) | Minor Adverse | Moderate Adverse | Substantial Adverse |
| Just below objective/limit value | Minor Adverse | Moderate Adverse | Moderate Adverse |

| **Absolute concentration in relation to objective / limit value** | **Change in concentration*** | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| with scheme (36-40µg/m$^3$) | | | |
| Below objective/limit value with scheme (30-36µg/m$^3$) | Negligible | Minor Adverse | Minor Adverse |
| Well below objective/limit value with scheme (<30µg/m$^3$) | Negligible | Negligible | Minor Adverse |
| Decrease with scheme | | | |
| Above objective/limit value without scheme (>40µg/m$^3$) | Minor Beneficial | Moderate Beneficial | Substantial Beneficial |
| Just below objective/limit value without scheme (36-40µg/m$^3$) | Minor Beneficial | Moderate Beneficial | Moderate Beneficial |
| Below objective/limit value without scheme (30-36µg/m$^3$) | Negligible | Minor Beneficial | Minor Beneficial |
| Well below objective/limit value without scheme (<30µg/m$^3$) | Negligible | Negligible | Minor Beneficial |

**An imperceptible change (see Table 6.13) would be described as negligible*

*Impact Magnitude and Receptor Sensitivity*

6.2.60 The significance of an environmental impact for vehicular emissions is determined by the interaction of magnitude and sensitivity. The methodology for determining the sensitivity of the receptor is shown in Table 6.15.

**Table 6.15 - Methodology for Determining Sensitivity**

| **Sensitivity** | **Methodology** |
|---|---|
| High | The location has little ability to absorb change without fundamentally altering its present character, or is of international or national importance. e.g. a hospital |
| Moderate | The location has moderate capacity to absorb change without significantly altering its present character, or is of high importance. e.g. a residential dwelling |
| Low | The location is tolerant of change without detriment to its character, is of low or local importance. e.g. an industrial development |

6.2.61 Ten of the eleven existing sensitive receptor locations, with the exception of ESR 7, are residential in nature and are therefore considered to be moderately sensitive, in accordance with the criteria detailed in Table 6.15. ESR 7 is a residential care home (85 Bloxham Road) and is therefore considered to be highly sensitive.

6.2.62 The Impact Significance Matrix used in this assessment is shown in Table 6.16.

**Table 6.16: Impact Significance Matrix**

| Magnitude of Impact | Sensitivity | | |
|---|---|---|---|
| | **High** | **Moderate** | **Low** |
| Substantial | Substantial Adverse/Beneficial | Substantial – Moderate Adverse/Beneficial | Substantial – Minor Adverse/Beneficial |
| Moderate | Substantial – Moderate Adverse/Beneficial | Moderate – Minor Adverse/Beneficial | Minor Adverse/Beneficial |
| Minor | Moderate – Minor Adverse/Beneficial | Minor Adverse/Beneficial | Minor – Negligible |
| Negligible | Negligible/Not Significant | Negligible/Not Significant | Negligible/Not Significant |

**Uncertainties and Limitations**

6.2.63 Traffic flow information for the construction phase of the development is not available at this stage and therefore it is not possible to undertake a quantitative assessment of the impact of these additional vehicles at existing sensitive receptor locations.

## 6.3 RELEVANT POLICY

### Air Quality Standards and Objectives

6.3.1 The UK National Air Quality Strategy (NAQS) was published in March 1997 fulfilling the requirement under the Environment Act 1995 for a national air quality strategy setting out policies for the management of ambient air quality. The Strategy sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide, sulphur dioxide, carbon monoxide, lead, fine particulates ($PM_{10}$), benzene, 1,3–butadiene and ozone.

6.3.2 The Strategy was reviewed and a Review Report[2] and Consultation Document[3] were published by the Department of the Environment, Transport and the Regions in 1999. A revised version (The Air Quality Strategy (AQS) 2000), which supersedes the 1997 Strategy, was published in January 2000. The AQS 2000 strengthens the objectives for a number of pollutants with the exception of that for particulates, which was replaced with the less stringent EU limit value.

6.3.3 The objectives for the eight pollutants in the Strategy provide the basis of the implementation of Part IV of the Environment Act 1995. The Air Quality Strategy objectives for each pollutant, except ozone, were given statutory status in the Air Quality (England) Regulations, 2000[4] and Air Quality (England) (Amendment) Regulations 2002[5] ('the Regulations').

6.3.4 In 2007 the Air Quality Strategy was revised. This latest strategy[6] does not remove any of the objectives set out in the previous strategy or its addendum, apart from replacing the provisional 2010 objective for $PM_{10}$ in England, Wales and Northern Ireland with the exposure reduction approach for $PM_{2.5}$. The UK Government and the Devolved Administrations have now therefore set new national air quality objectives for particulate matter smaller than 2.5µm diameter ($PM_{2.5}$).

[2] Department of the Environment, Transport and the Regions, January 1999. Report on the Review of the National Air Quality Strategy, Proposals to amend the Strategy.
[3] Department of the Environment, Transport and the Regions 1999, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document.
[4] The Air Quality (England) Regulations 2000. SI No 928.
[5] The Air Quality (Amendment) Regulations 2002.
[6] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007.

6.3.5 EU Directive 2008/50/EC[7] came into force in June 2008 and was transposed into legislation in England on 11th June 2010 as 'The Air Quality Standards Regulations 2010'[8]. This EU Directive consolidates existing air quality legislation and provides a new regulatory framework for $PM_{2.5}$.

6.3.6 The current Air Quality Standards and Objectives, as set out in the Air Quality Standards Regulations 2010, are detailed in Table 6.17.

**Table 6.17 - Air Quality (England) Regulations 2010. Summary of Current Air Quality Standards and Objectives**

| **Pollutant** | **Averaging Period** | **Limit Value** |
|---|---|---|
| Sulphur Dioxide | 1 hour | 350µg/m$^3$ not to be exceeded more than 24 times a calendar year |
| | 1 day | 125µg/m$^3$ not to be exceeded more than 3 times a calendar year |
| Nitrogen Dioxide | 1 hour | 200µg/m$^3$ not to be exceeded more than 18 times a calendar year |
| | Calendar year | 40µg/m$^3$ |
| Benzene | Calendar year | 5µg/m$^3$ |
| Lead | Calendar year | 0.5µg/m$^3$ |
| $PM_{10}$ | 1 day | 50µg/m$^3$ not to be exceeded more than 35 times a calendar year |
| | Calendar year | 40µg/m$^3$ |
| $PM_{2.5}$ | Calendar year | 25µg/m$^3$ to be met by 1st January 2015 |
| Carbon Monoxide | Maximum 8 hour daily mean | 10mg/m$^3$ |
| **Pollutant** | **Target Value for the total content in the $PM_{10}$ fraction averaged over a calendar year** | **Date by which target value should be met** |
| Arsenic | 6ng/m$^3$ | 31st December 2012 |
| Cadmium | 5ng/m$^3$ | 31st December 2012 |
| Nickel | 20ng/m$^3$ | 31st December 2012 |
| Benzo(a)pyrene | 1ng/m$^3$ | 31st December 2012 |

[7] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe.
[8] Statutory Instruments 2010 No. 1001 The Air Quality Standards Regulations 2010.

6.3.7 Examples of where the Air Quality Objectives should/should not apply are included in Table 6.18. This table is taken from Local Air Quality Management Technical Guidance document LAQM.TG (09)[9].

[9] Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance 2009.

**Table 6.18 - Examples of where the Air Quality Objectives Should/Should Not Apply**

| Averaging Period | Objectives Should Apply At | Objectives Should Generally Not Apply At |
|---|---|---|
| Annual Mean | All background locations where members of the public might be regularly exposed.<br><br>Building facades of residential properties, schools, hospitals, libraries, etc. | Building facades of offices or other places of work where members of the public do not have regular access.<br><br>Hotels, unless people live there as their permanent residence.<br><br>Gardens of residential properties.<br><br>Kerbside sites or any other location where public exposure is expected to be short term. |
| 24 hour (daily) mean<br><br>8 hour mean | All locations where the annual mean objectives would apply together with Hotels.<br>Gardens of residential properties[1] | Kerbside sites, or any other location where public exposure is expected to be short term. |
| 1 hour mean | All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets).<br><br>Those parts of car parks and railway stations etc. which are not fully enclosed where members of the public might reasonably be expected to spend one hour or more.<br><br>Any outdoor locations to which the public might reasonably be expected to spend one hour or longer. | Kerbside sites where public would not be expected to have regular access. |
| 15 min mean | All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer. | |
| [1]: Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens although local judgement should always be applied. | | |

6.3.8 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007, establishes the framework for air quality improvements based on measures agreed at a national and international level. However, despite these measures, it is recognised that areas of poor air quality will remain and these should be dealt with through the Local Air Quality Management (LAQM) process using locally implemented measures.

6.3.9 LAQM legislation in the Environment Act 1995 requires local authorities to conduct periodic review and assessments of air quality. These aim to identify all those areas where the air quality objectives are being, or are likely to be, exceeded.

6.3.10 All Authorities were required to undertake the first stage of review and assessment which concluded in September 2001. In those areas identified as having the potential to experience elevated levels of pollutants the authority was required to undertake a more detailed second stage review comprising two steps; Updating and Screening Assessments and Detailed Assessments. Where it was predicted that one or more of the air quality objectives would be unlikely to be met by the end of 2005, local authorities were required to proceed to a third stage, and if necessary, declare Air Quality Management Areas and make action plans for improvements in air quality, in pursuit of the national air quality objectives.

6.3.11 In 2007 an Evaluation Report was commissioned by the UK Government and Devolved Administrations. Following this review revised LAQM Technical Guidance was published in February 2009 comprising LAQM. TG(09). This revised guidance draws together previous guidance and the recommendations of the 2007 Evaluation Report. TG(09) maintains the phased approach to review and assessment established in previous technical guidance. The intention is that local authorities should only undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded.

6.3.12 Where a Detailed Assessment indicates that any of the air quality objectives are likely to be exceeded, an Air Quality Management Area (AQMA) must be designated, or the geographical boundaries of an existing AQMA must be confirmed. An AQMA should only be declared if a Detailed Assessment has been undertaken.

6.3.13 Once an AQMA has been declared the local authority is required to undertake a Further Assessment within 12 months of the declaration.

6.3.14 A rolling programme of Updating and Screening Assessment and Detailed Assessment based on a three-year cycle has been laid down by Defra in its TG(09) policy guidance (Defra 2009). This is supplemented by Progress Reports which are intended to maintain continuity in the LAQM process between the three-yearly cycle of Review and Assessment. Progress Reports are required in the years when the authority is not completing an Updating and Screening Assessment.

**National Planning Policy Framework (March 2012)**

6.3.15 The National Planning Policy Framework, introduced in March 2012, requires that planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any development in AQMAs is consistent with the local air quality action plan.

**National Planning Policy Guidance**

6.3.16 The National Planning Practice Guidance states that whether or not air quality is relevant to a planning decision will depend on the Proposed Development and its location. Concerns could arise if the development is likely to generate air quality impacts in the area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

**Cherwell District Local Plan (1996)**

6.3.17 Cherwell District Local Plan (1996) states that the quality of the countryside is its greatest asset in attracting visitors, therefore it is important that it is protected whilst at the same time providing for the needs of the local community, local economy and visitors to the area. The characteristics of the countryside which attract visitors include natural beauty, landscape diversity and conservation value, and natural features and land/water/air resources which can be used for sport.

**The Non-Statutory Cherwell District Local Plan (2004)**

6.3.18 The non-statutory Cherwell District Local Plan (2004) aimed to locate development, influence the provision of infrastructure and manage traffic to achieve the best use of available highway space, reduce traffic congestion on sensitive parts of the network and positively promote walking, cycling and travelling by bus to reduce the reliance on the private car.

6.3.19 The Plan states that land use planning can influence air quality by reducing the need to travel through the location of development and promoting transport choices and

mixed-use developments. Planning can also guide the location of polluting industry and those developments which are sensitive to air quality.

6.3.20 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.

6.3.21 Any air quality consideration is capable of being a material consideration. The influence of air quality considerations on planning decisions will vary according to the circumstances of the proposal and must be weighed against other material considerations.

6.3.22 Planning decisions should have regard to any Air Quality Management Areas and action plans. It is not unrealistic that further more detailed stages of the monitoring process or further development could lead to the identification of such areas during the plan period. In such circumstances it is likely that air quality considerations would have greater weight.

**Draft Cherwell Local Plan (2014)**

6.3.23 The Draft Cherwell Local Plan (2014) identifies that one of Cherwell's key challenges to ensuring sustainable development is the need to consider the effects of development on air quality, including in relation to the Air Quality Management Area (AQMA) in Banbury and how development proposals can contribute towards improvements. Air quality assessments will also be required for development proposals that would be likely to have a significantly adverse impact on biodiversity by generating an increase in air pollution.

6.3.24 New housing needs to be provided in such a way that it minimises environmental impact, including through the elimination and control of pollution and the effective and efficient use of natural resources. Planning decisions can have an effect on travel to work, schools, noise and air quality, access to services, climate change and social networks which can all contribute to health and well-being. The local environment has a fundamental impact on the health and well-being of local people.

By providing facilities such as local open space this allows for activities such as walking and cycling, promoting healthy lifestyles.

**Cherwell District Council Local Air Quality Management Review and Assessment**

6.3.25 Cherwell District Council (CDC) declared an Air Quality Management Area (AQMA), in 2010, for exceedences of the annual mean and hourly objectives for nitrogen dioxide ($NO_2$). The AQMA covers the A422 Hennef Way in the centre of Banbury, between the A4260 Concord Avenue and Ermont Way; approximately 2.8km to the north of the Proposed Development.

6.3.26 The 2009 Updating and Screening Assessment identified exceedances of the annual mean objective for $NO_2$ at the A361 Horsefair and Hennef Way in Banbury and at Queens Avenue in Bicester. The report concluded that air quality objectives are being achieved at all other monitoring locations throughout the district.

6.3.27 A Detailed Assessment was subsequently undertaken by CDC for Hennef Way in 2010 and the AQMA declared. The report also concluded that further monitoring should be undertaken along Hennef Way and at the closest areas of exposure, i.e. at the residential properties along Stroud Close and Fisher Close.

6.3.28 The 2011 Progress Report, published by CDC, identified the requirement for Detailed Assessments at Queens Avenue, Bicester and Horsefair, Banbury. Exceedances of the annual mean $NO_2$ objective were also identified on Bicester Road, Kidlington.

6.3.29 The 2012 Updating and Screening Assessment, and previous Detailed Assessments, identified the requirement to declare AQMAs for the following areas: Horsefair / North Bar (Banbury), Queens Avenue / Kings End (Bicester) and Bicester Road (Kidlington).

6.3.30 The 2014 CDC Progress Report identified potential exceedances of the annual mean $NO_2$ objective level along Bloxham Road, Oxford Road and North Bar within Banbury.

6.3.31 CDC undertakes air quality monitoring within the Cherwell district. In 2013, CDC operated diffusion tube monitoring of $NO_2$ at 49 sites across the district.

6.3.32 The Proposed Development is not located within an existing AQMA. The closest roadside diffusion tubes to the Site are those located along the A361 Bloxham Road and the A4260 / B4100 Oxford Road. In 2013, these diffusion tubes measured annual mean concentrations of between 39.4µg/$m^3$ and 41.8µg/$m^3$.

## 6.4 BASELINE CONDITIONS

***Operational Phase Assessment – Road Traffic Emissions***

6.4.1 The traffic flow information for the baseline assessment considers the Land East of Bloxham Road Scheme committed development.

*Background Air Pollutant Concentrations*

6.4.2 The ADMS assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed. The data may be derived through long term ambient measurements at background sites, remote from immediate sources of air pollution, or alternatively from the default concentration maps, which have been provided for use with the revised LAQM.TG(09) guidance.

6.4.3 CDC currently operates three background diffusion tubes within Banbury. These are located on Cranleigh Close, Longworth Close and Grimsbury Green. It was considered that the urban background diffusion tube on Cranleigh Close was representative of background concentrations at the existing receptor locations along the A361 Bloxham Road (i.e. ESR 1-4 and 7) and the proposed receptor locations (PR 1-3). Therefore, the 2013 background $NO_2$ concentration has been obtained for the Cranleigh Close diffusion tube. The $NO_x$ background concentration has been obtained using the Defra $NO_x$ to $NO_2$ calculator. The urban background diffusion tubes located on Longworth Close and Grimsbury Green had data capture of less than 75%, therefore it was decided to not use these diffusion tubes for the purposes of background $NO_2$ concentrations. Therefore, for the existing receptors located within Banbury town centre (i.e. ESR 5, 6 and 8-11) background $NO_x$ and $NO_2$ concentrations have been obtained from the 2011 based default concentration maps provided by Defra on their Local Air Quality Management web pages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html) for the appropriate grid squares.

6.4.4 In the absence of data being available from a representative background continuous analyser, background $PM_{10}$ concentrations have also been obtained from the 2011 based default concentration maps provided by Defra. As the receptors are located within more than one grid square, the highest $PM_{10}$ concentration has been used in the assessment.

6.4.5 To provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will some improvement in background air quality and emission factors by 2022.

6.4.6 The background pollutant concentrations used in the assessment are detailed in Table 6.19.

**Table 6.19 - Background $NO_x$, $NO_2$ and $PM_{10}$ Concentrations Obtained from the 2011-based Defra Default Concentration Maps**

| Receptors | 2013 Pollutant Concentrations (µg/m$^3$) | | |
|---|---|---|---|
| | Oxides of Nitrogen ($NO_x$) | Nitrogen Dioxide ($NO_2$) | Particulates ($PM_{10}$) |
| ESR 1 – 4 and 7 and PR 1-3***** | 19.11 | 13.50 | 18.82 |
| ESR 5, 8, 10 and 11 | 27.92 | 19.44 | |
| ESR 6 and 9 | 20.87 | 14.94 | |
| ***** $NO_2$ concentrations obtained from the Cranleigh Close urban background diffusion tube. $NO_x$ concentrations obtained using the Defra $NO_x$ to $NO_2$ calculator. | | | |

*Modelled Baseline Concentrations*

6.4.7 The baseline assessment (i.e. Scenarios 1 and 2) has been carried out for the eleven existing sensitive receptors considered (ESR 1 to ESR 11). The uncorrected $PM_{10}$ and corrected $NO_2$ concentrations are detailed in Table 6.20 and included in Appendices 6.6 and 6.7, respectively.

**Table 6.20 - Predicted $NO_2$ and $PM_{10}$ concentrations at Existing Sensitive Receptor Locations for 2013 and 2022 'Without Development' Scenarios**

| Receptor | Calculated Annual Mean Concentrations (µg/m$^3$) | | | |
|---|---|---|---|---|
| | $NO_2$ (Corrected)* | | $PM_{10}$ (Uncorrected) | |
| | Scenario 1: 2013 | Scenario 2: 2022 | Scenario 1: 2013 | Scenario 2: 2022 |
| ESR 1 | 23.22 | 24.22 | 20.24 | 20.40 |
| ESR 2 | 26.68 | 27.95 | 20.78 | 20.99 |
| ESR 3 | 24.61 | 25.75 | 20.45 | 20.64 |
| ESR 4 | 30.29 | 31.91 | 21.37 | 21.65 |
| ESR 5 | 42.72 | 44.81 | 22.61 | 23.02 |
| ESR 6 | 27.38 | 28.65 | 20.67 | 20.87 |
| ESR 7 | 26.41 | 27.69 | 20.73 | 20.94 |
| ESR 8 | 40.21 | 42.14 | 22.15 | 22.51 |
| ESR 9 | 25.11 | 26.17 | 20.31 | 20.48 |
| ESR 10 | 30.48 | 31.60 | 20.36 | 20.53 |
| ESR 11 | 38.22 | 39.95 | 21.73 | 22.04 |

** $NO_2$ concentrations obtained by inputting adjusted predicted road $NO_x$ concentrations into the $NO_x$ to $NO_2$ calculator in accordance with LAQM.TG(09).*

*Scenario 1: Verification and Base Year 2013*

6.4.8 The 2013 'baseline' annual mean $NO_2$ concentrations (corrected) are predicted to range from 23.22 to 42.72µg/m$^3$ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m$^3$) is predicted to occur at ESR 5 (9 Oxford Road) and ESR 8 (8 Oxford Road).

6.4.9 ESR 5 and ESR 8 are located at a junction (A361 Bloxham Road / B4100 Oxford Road / A361 South Bar Street) where $NO_2$ diffusion tube data, for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at these existing sensitive receptor locations.

6.4.10 The 2013 'baseline' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range from 20.24 to 22.61 µg/m$^3$ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/m$^3$) is not predicted to occur.

*Scenario 2: Future Year 2022 Without Development*

6.4.11 The 2022 'without development' annual mean $NO_2$ concentrations (corrected) are predicted to range from 24.22 to 44.81µg/m$^3$ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m$^3$) is predicted to occur at ESR 5 and 8. The predicted $NO_2$ concentration for ESR 11 is very close to the annual mean objective concentration.

6.4.12 ESR 11 (2 Horse Fair) is located on the A361 Horse Fair where $NO_2$ diffusion tube data (within 3m of the kerb), for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at this existing sensitive receptor location.

6.4.13 It is important to note that, in order to provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors by 2022. Therefore, the predicted $NO_2$ concentrations for all receptor locations assume a worst case scenario.

6.4.14 The 2022 'without development' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range from 20.40 to 23.02µg/$m^3$ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/$m^3$) is not predicted to occur.

## 6.5 POTENTIAL EFFECTS

### Construction Stage

***Construction Phase Assessment – Dust Emissions***

6.5.1 The main activities involved with the construction phase of works are as follows:

**Earthworks** which may be required prior to construction phase of works can include:

- Cleaning the Site;
- Stripping and stockpiling of topsoil and subsoil;
- Ground excavation;
- Bringing in, tipping and spreading materials on Site;
- Stockpiling materials;
- Levelling ground;
- Trenching;
- Road construction;
- Vehicle movements on Sites roads; and
- Windblown materials from Site.

**Construction** which will involve construction of individual building access roads, the car parking areas and the building themselves; and

**Trackout** which is the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty material onto road surfaces or through transportation of dirt by vehicles that have travelled over muddy ground on the Site. This dust and dirt can then be deposited and re-suspended by other vehicles.

There are no existing buildings located on the Proposed Development Site, Therefore, demolition activities on Site will be limited to demolition of small-scale agricultural structures, such as stone walls. Demolition activities are therefore not considered any further within this assessment.

*Step 2A*

6.5.2 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from earthworks, construction activities and trackout in the absence of site specific mitigation.

6.5.3 Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

*Step 2B*

6.5.4 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in Tables 6.5 to 6.9, to earthworks, construction activities and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health effects and ecological impacts.

6.5.5 The nearest receptors are the residential properties located to the west of the site boundary along Bloxham Road and to the north along Foxwood Close, Leawood Close and Jaynes Close. For earthworks and construction activities, there are more than 10 residential receptor locations within 50m of where these activities may take place. The potential Salt Way LWS is located within 20m of where earthworks and construction activities may take place.

6.5.6 For trackout, there are more than 10 residential receptor locations within 50m of where trackout may occur, for a distance of up to 500m from the Site entrance. The potential Salt Way LWS is located within 20m of where trackout may occur, i.e. roads within 500m of the Site entrance on which construction vehicles may travel.

*Step 2C*

6.5.7 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area.

6.5.8 In accordance with the IAQM guidance, the risk of dust impacts from each activity, with no mitigation in place, has been assessed against the criteria detailed in Tables 6.10 to 6.12.

**Summary**

6.5.9 Table 6.21 details the result of Step 2 of the construction phase assessment for human receptors.

**Table 6.21: Construction Phase Dust Assessment (Step 2) – Human Receptors**

| | Activity | | | |
|---|---|---|---|---|
| | **Demolition** | **Earthworks** | **Construction** | **Trackout** |
| **Step 2A** | | | | |
| Dust Emission Magnitude | N/A | Large[a] | Large[b] | Medium[c] |
| **Step 2B** | | | | |
| Sensitivity of Closest Receptors | N/A | High | High | High |
| Sensitivity of Area to Dust Soiling Effects | N/A | Medium | Medium | Medium |
| Sensitivity of Area to Human Health Effects | N/A | Low | Low | Low |
| **Step 2C** | | | | |
| Dust Risk: Dust Soiling | N/A | Medium risk | Medium risk | Medium risk |
| Dust Risk: Human Health | N/A | Low risk | Low risk | Low risk |

*a. Total site area is more than 10,000m$^2$*
*b. Total building volume estimated to be more than 100,000 m$^3$*
*c. Estimation of the dust emission class based on the size of the development (large) and estimated HGV movements per day (<100 HGVs per day and upaved road length of <100m).*
*d. Background annual mean $PM_{10}$ concentration is considered to be less than 24µg/m$^3$ (taken from the Defra default concentration maps, for the appropriate grid squares, for 2014).*

6.5.10 Table 6.22 details the results of Step 2 of the construction phase assessment for ecological receptors.

**Table 6.22: Construction Phase Dust Assessment (Step 2) – Ecological Receptors**

| | Activity | | | |
|---|---|---|---|---|
| | **Demolition** | **Earthworks** | **Construction** | **Trackout** |
| **Step 2A** | | | | |
| Dust Emission Magnitude | N/A | Large[a] | Large[b] | Medium[c] |
| **Step 2B** | | | | |
| Sensitivity of Closest Receptors | N/A | Low | Low | Low |
| Sensitivity of Area to Ecological Effects | N/A | Low | Low | Low |
| **Step 2C** | | | | |

| | Activity | | | |
|---|---|---|---|---|
| | **Demolition** | **Earthworks** | **Construction** | **Trackout** |
| Dust Risk: Ecological Impacts | N/A | Low risk | Low risk | Low risk |

*a. Total site area is more than 10,000m²*
*b. Total building volume estimated to be more than 100,000 m³*
*c. Estimation of the dust emission class based on the size of the development (large) and estimated HGV movements per day (<100 HGVs per day and upaved road length of <100m).*
*d. Ecological receptor considered to be of a low sensitivity as the potential Local Wildlife Site is not statutorily protected.*

**Post-Completion Stage**

6.5.11 The traffic flow information for the post-completion stage assessment considers the Land East of Bloxham Road Scheme committed development.

6.5.12 The impact assessment has been carried out for the representative existing sensitive receptor locations (ESR 1 to ESR 11). Table 6.23 shows the changes in pollutant concentrations between the 2022 future year 'without development' and 'with development' scenarios. The uncorrected $PM_{10}$ concentrations are included in Appendix 6.6 and corrected $NO_2$ predicted concentrations are detailed in Appendix 6.7.

**Table 6.23 - Predicted $NO_2$ and $PM_{10}$ Concentrations at Existing Sensitive Receptor Locations for 2022 'Without Development' and 'With Development' Scenarios**

| **Receptor** | **Level of Development** | **Calculated Annual Mean Concentrations (µg/m³)** | | | |
|---|---|---|---|---|---|
| | | **$NO_2$ (Corrected)** | **Change in $NO_2$ / Impact Significance** | **$PM_{10}$ (Uncorrected)** | **Change in $PM_{10}$ / Impact Significance** |
| ESR 1 | Without development | 24.22 | | 20.40 | |
| | With development | 24.65 | | 20.47 | |
| | *With – without development* | *+0.43 µg/m³* | *Small / Negligible* | *+0.07 µg/m³* | *Imperceptible / Negligible* |
| ESR 2 | Without development | 27.95 | | 20.99 | |
| | With development | 24.16 | | 20.03 | |
| | *With – without development* | *-3.79 µg/m³* | *Medium / Negligible* | *- 0.96 µg/m³* | *Small / Negligible* |
| ESR 3 | Without | 25.75 | | 20.64 | |

| Receptor | Level of Development | Calculated Annual Mean Concentrations (µg/m³) | | | |
|---|---|---|---|---|---|
| | | **$NO_2$ (Corrected)** | **Change in $NO_2$ / Impact Significance** | **$PM_{10}$ (Uncorrected)** | **Change in $PM_{10}$ / Impact Significance** |
| | development | | | | |
| | With development | 26.33 | | 20.74 | |
| | *With – without development* | *+ 0.58 µg/m³* | *Small / Negligible* | *+0.10 µg/m³* | *Imperceptible / Negligible* |
| ESR 4 | Without development | 31.91 | | 21.65 | |
| | With development | 32.41 | | 21.77 | |
| | *With – without development* | *+ 0.50 µg/m³* | *Small / Negligible* | *+ 0.12 µg/m³* | *Imperceptible / Negligible* |
| ESR 5 | Without development | 44.81 | | 23.02 | |
| | With development | 45.71 | | 23.28 | |
| | *With – without development* | *+ 0.90 µg/m³* | *Small / Minor Adverse* | *+ 0.26 µg/m³* | *Imperceptible / Negligible* |
| ESR 6 | Without development | 28.65 | | 20.87 | |
| | With development | 28.83 | | 20.91 | |
| | *With – without development* | *+ 0.18 µg/m³* | *Imperceptible / Negligible* | *+ 0.04 µg/m³* | *Imperceptible / Negligible* |
| ESR 7 | Without development | *27.69* | | *20.94* | |
| | With development | *29.09* | | *21.26* | |
| | *With – without development* | *+1.40 µg/m³* | *Small / Negligible* | *+0.32 µg/m³* | *Imperceptible / Negligible* |
| ESR 8 | Without development | *42.14* | | *22.51* | |
| | With development | *43.65* | | *22.93* | |
| | *With – without development* | *+1.51 µg/m³* | *Small / Minor Adverse* | *+0.42 µg/m³* | *Small / Negligible* |
| ESR 9 | Without development | *26.17* | | *20.48* | |
| | With development | *26.27* | | *20.50* | |
| | *With – without development* | *+0.10 µg/m³* | *Imperceptible / Negligible* | *+0.02 µg/m³* | *Imperceptible / Negligible* |
| ESR 10 | Without | *31.60* | | *20.53* | |

| Receptor | Level of Development | Calculated Annual Mean Concentrations (µg/m³) | | | |
|---|---|---|---|---|---|
| | | **$NO_2$ (Corrected)** | **Change in $NO_2$ / Impact Significance** | **$PM_{10}$ (Uncorrected)** | **Change in $PM_{10}$ / Impact Significance** |
| | development | | | | |
| | With development | *32.20* | | *20.67* | |
| | *With – without development* | *+0.60 µg/m³* | *Small / Negligible* | *+0.14 µg/m³* | *Imperceptible / Negligible* |
| ESR 11 | Without development | *39.95* | | *22.04* | |
| | With development | *40.80* | | *22.27* | |
| | *With – without development* | *+0.85 µg/m³* | *Small / Minor Adverse* | *+0.23 µg/m³* | *Imperceptible / Negligible* |
| ** Change in $NO_2$ concentration and impact significance determined using the air quality significance criteria detailed in Sections 6.2.58 to 6.2.63.* | | | | | |

*Scenario 3: Future Year 2022 'With Development'*

6.5.13 The 2022 'with development' annual mean $NO_2$ concentrations (corrected) are predicted to range from 24.16 to 45.71µg/m³ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m³) is predicted to occur at ESR 5, ESR 8 and ESR 11.

6.5.14 ESR 5 and ESR 8 are located at a junction (A361 Bloxham Road / B4100 Oxford Road / A361 South Bar Street) where $NO_2$ diffusion tube data, for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at these existing sensitive receptor locations.

6.5.15 ESR 12 (2 Horse Fair) is located on the A361 Horse Fair where $NO_2$ diffusion tube data (within 3m of the kerb), for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at this existing sensitive receptor location.

6.5.16 It is important to note that, in order to provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors by 2022. Therefore, the predicted $NO_2$ concentrations for all receptor locations assume a worst case scenario.

6.5.17 The 2022 'with development' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range from 20.03 to 23.28µg/m$^3$ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/m$^3$) is not predicted to occur.

**Assessment of Significance**

***Existing Sensitive Receptor Locations***

6.5.18 Using the air quality significance criteria, detailed in Sections 6.2.58 to 6.2.63 of this report, the impacts to air quality due to changes in pollutant concentrations can be assessed at the eleven existing sensitive receptor locations considered.

**$NO_2$ Concentrations**

6.5.19 For 2022, all of the existing receptor locations, with the exception of ESR 2, 6 and 9, are predicted to experience a small increase in $NO_2$ concentration as a result of the Proposed Development (i.e. an increase of between 0.4 and 2.0µg/m$^3$, in accordance with Table 6.13). ESR 2 is predicted to experience a medium decrease (i.e. a decrease of between 2.0 and 4.0µg/m$^3$) and ESR 6 and 9 are predicted to experience an imperceptible increase (i.e. an increase of less than 0.40µg/m$^3$).

6.5.20 The decrease in $NO_2$ concentrations observed at ESR 2 (2 Crouch Cottages) is due to a change in the alignment of Bloxham Road, with the development in place. The proposed Site access will join Bloxham Road at a new roundabout, which will result in traffic being diverted further away from ESR 2.

6.5.21 All existing receptor locations, with the exception of ESR 5, 8 and 11, are predicted to experience a negligible impact as a result of the Proposed Development, in accordance with Table 6.14. ESR 5, 8 and 11 are predicted to experience a minor adverse impact.

6.5.22 Predicted $NO_2$ concentrations are below the objective / limit values for eight of the eleven existing sensitive receptors considered. Exceedances of the $NO_2$ annual mean objective value are predicted to occur for ESR 5, 8 and 11. For ESR 5 and 8, exceedances of the $NO_2$ annual mean air quality objective of 40µg/m$^3$ are predicted

for both without and with the development in place. The Proposed Development does not lead to an exceedance on any of the air quality objectives.

6.5.23 For ESR 11, an exceedance of the $NO_2$ annual mean air quality objective of 40µg/m$^3$ is predicted for the 2022 with development scenario only. However, it is important to note that the predicted concentration for the 2022 without development scenario is very close to the 40µg/m$^3$ objective level (i.e. 39.95 µg/m$^3$).

6.5.24 All existing receptor locations are considered moderately sensitive, with the exception of ESR 7, in accordance with the criteria detailed in Table 6.15. ESR 7 is a residential care home (85 Bloxham Road) and is considered to be highly sensitive. Eight of the eleven receptors considered are predicted to experience a 'negligible/not significant' impact on $NO_2$ concentrations as a result of the Proposed Development when the magnitude of impact is considered along with the sensitivity of the receptor, in accordance with Table 6.16.

6.5.25 The exceptions to this are ESR 5, 8 and 11. The increases in $NO_2$ concentration in 2022, as a result of the Proposed Development, are small (i.e. there will only be an increase of between 0.4 and 2µg/m$^3$) for all three receptor locations. Therefore, these receptor locations are predicted to experience a 'minor adverse' impact, due to the predicted $NO_2$ concentrations being above, or very close to, the annual mean objective for both the 'without development' and 'with development' scenarios.

6.5.26 It is important to note that, in order to provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors by 2022. Therefore, the predicted $NO_2$ concentrations for all receptor locations assume a worst case scenario.

**$PM_{10}$ Concentrations**

6.5.27 For 2022, all existing receptor locations, with the exception of ESR 2 and 8, are predicted to experience an imperceptible increase in $PM_{10}$ concentrations as a result of the Proposed Development (i.e. an increase of less than 0.4µg/m$^3$, in accordance with Table 6.13). ESR 2 is predicted to experience a small decrease as a result of the Proposed Development (i.e. a decrease of between 0.4 and 2.0µg/m$^3$), due to the realignment of Bloxham Road. ESR 8 is predicted to experience a small increase as a result of the Proposed Development (i.e. an increase of between 0.4 and

2.0µg/m$^3$). All existing receptor locations are, therefore, predicted to experience a negligible impact as a result of the Proposed Development, in accordance with Table 6.14.

6.5.28 All predicted $PM_{10}$ concentrations are well below the objective / limit values and no exceedances of the $PM_{10}$ annual mean air quality objective of 40µg/m$^3$ are predicted to occur in 2022 for both the 'without development' and 'with development' scenarios.

6.5.29 All existing receptor locations are considered moderately sensitive, with the exception of ESR 7, in accordance with the criteria detailed in Table 6.15. ESR 7 is considered to be highly sensitive. All eleven receptors considered are predicted to experience a 'negligible/not significant' impact on $PM_{10}$ concentrations as a result of the Proposed Development when the magnitude of impact is considered along with the sensitivity of the receptor, in accordance with Table 6.16.

***Proposed Sensitive Receptor Locations***

6.5.30 Air pollutant concentrations have been modelled for three proposed receptor locations for the 2022 'with development' scenarios, as detailed in Table 6.24. The uncorrected $PM_{10}$ concentrations are included in Appendix 6.6, and the corrected $NO_2$ concentrations are included in Appendix 6.7.

**Table 6.24 - Predicted Pollutant Concentrations at Proposed Receptor Points for 2022 'With Development' Scenarios**

| Proposed Receptor Point | Calculated Annual Mean Concentrations (µg/m$^3$) | |
|---|---|---|
| | $NO_2$ (Corrected) | $PM_{10}$ (Uncorrected) |
| | 2022 | 2022 |
| PR 1 | 26.00 | 20.27 |
| PR 2 | 29.59 | 20.98 |
| PR 3 | 21.23 | 19.79 |

*Scenario 3: Future Year 2022 With Development*

6.5.31 The 2022 'with development' annual mean $NO_2$ concentrations (corrected) are predicted to range between 21.23 and 29.59µg/m$^3$ for the three proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m$^3$) is not predicted to occur.

6.5.32 The 2022 'with development' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range between 19.79 to 20.98µg/$m^3$ for the three proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/$m^3$) is not predicted to occur.

## 6.6 MITIGATION MEASURES

### Construction Stage

***Construction Phase Assessment – Dust Emissions***

***Step 3***

6.6.1 During the construction phase the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and particulate matter to be generated.

6.6.2 Step 2C of the construction phase assessment identified that:

- The risk of dust soiling effects is classed as medium for earthworks, construction activities and trackout;
- The risk of human health effects is classed as low for earthworks, construction activities and trackout; and
- The risk of ecological effects is classed as low for earthworks, construction activities and trackout.

6.6.3 This assumes that no mitigation measures are applied, except those required by legislation. Site specific mitigation measures do not need to be recommended if the risk category is negligible.

6.6.4 As the risk category for these activities are not negligible, site specific mitigation measures will need to be implemented to ensure that dust effects will not be significant.

6.6.5 A Construction Management Plan will be written and implemented for the Site. This will set out the practical measures that could be incorporated as part of a best working practice scheme. This will take into account the recommendations included within the Institute of Air Quality Management (IAQM), which may include but are not limited to:

- Ensuring sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Screening, where possible, to protect neighbouring residents;

- Exposed stored materials will be damped down and stored as far from sensitive receptors as possible;
- Activities that generate large amounts of dust will be avoided during windy conditions.
- End of day tidying to be carried out to ensure protection of the Site outside the hours of construction;
- Dust from general traffic at the site during earthworks and construction works will be controlled by the provision of a road sweeper for use on Site and public highways;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Site. This may require the sweeper being continuously in use;
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably possible using wet cleaning methods.

6.6.6 It is recognised that the final design solutions will be developed with the input of the Contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials, and to incorporate the particular skills and experience offered by the successful contractor.

**Post-Completion Stage**

***Operational Phase Assessment – Road Traffic Emissions***

*Existing Sensitive Receptor Locations*

6.6.7 A detailed air quality assessment has been undertaken to consider the potential impact of the Proposed Development on air quality at eleven representative existing sensitive receptor locations.

6.6.8 The air quality assessment has predicted that there will be a 'negligible / not significant' impact on concentrations of $NO_2$, at eight of the eleven existing receptors considered, in 2022 with the development in place.

6.6.9 ESR 5, 8 and 11 are predicted to experience a 'minor adverse' impact on $NO_2$ concentrations. The increase in predicted $NO_2$ concentrations at these receptor locations, as a result of the Proposed Development, is classed as small (i.e. there will

only be an increase of less than 2.0µg/$m^3$ in 2022). The impact is only described as 'minor adverse' due to predicted $NO_2$ concentrations at the receptor locations being above, or very close to, the annual mean objective of 40µg/$m^3$ even without the development in place.

6.6.10 In addition, the use of current year (i.e. 2013) backgrounds and emissions factors is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors before 2022.

6.6.11 The air quality assessment has also predicted that there will be a 'negligible / not significant' impact on concentrations of $PM_{10}$, at all thirteen existing receptors considered, in 2022 with the development in place. All predicted $PM_{10}$ concentrations are well below the annual mean objective of 40µg/$m^3$.

6.6.12 The impact of the operation of the Proposed Development is predicted to be 'minor adverse' or 'negligible / not significant', even when a worst case approach is adopted which assumes no improvement in backgrounds or emission factors. It may be possible to reduce the impact further with the implementation of a green travel plan.

*Proposed Sensitive Receptor Locations*

6.6.13 The air quality assessment has also predicted pollutant concentration at three receptor points within the Proposed Development Site. These are considered to be representative of the proposed residential areas closest to the proposed Site access and the A361 Bloxham Road.

6.6.14 Predicted $NO_2$ and $PM_{10}$ concentrations are below the annual mean air quality objectives of 40µg/$m_3$, for 2022, at the proposed sensitive receptor points considered.

## 6.7 RESIDUAL EFFECTS

### Construction Stage

***Construction Phase Assessment – Dust Emissions***

*Step 4*

6.7.1 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from earthworks, construction and trackout associated with the Proposed Development.

6.7.2 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance dust and particulate matter to be generated and any residual impacts are considered to be negligible.

### Post-Completion Stage

***Operational Phase Assessment – Road Traffic Emissions***

6.7.3 The air quality assessment indicates that eight of the eleven existing sensitive receptor locations considered are predicted to experience a 'negligible' impact in $NO_2$ concentrations, as a result of the Proposed Development. All eleven receptors are expected to experience a 'negligible' impact in $PM_{10}$ concentrations, as a result of the development.

6.7.4 The increases in predicted $NO_2$ concentrations at ESR 5, 8, and 11, as a result of the Proposed Development, are classed as small (i.e. there will only be an increase of less than 2.0µg/$m^3$ in 2022). The impact is only described as 'minor adverse' due to predicted $NO_2$ concentrations at these receptors being above, or close to, the annual mean objective of 40µg/$m^3$ even without the development in place.

6.7.5 In addition, the use of current year (i.e. 2013) backgrounds and emissions factors is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors before 2022.

6.7.6 The impact of the operation of the Proposed Development is predicted to be 'minor adverse' or 'negligible', even when a worst case approach is adopted which assumes

no improvement in backgrounds or emission factors. It may be possible to reduce the impact further with the implementation of a green travel plan.

**Summary of effects**

6.7.7 The potential effects, of the Proposed development on air quality, identified are summarised in Table 6.25 below:

**Table 6.25: Summary of Effects**

| Potential effect | Significance (pre-mitigation) | Mitigation measure | Significance of residual effect |
|---|---|---|---|
| **Construction Stage** | | | |
| Dust soiling at existing receptors | Significant with a medium risk | A Construction Management Plan | Negligible |
| Human health effects at existing receptors | Significant with a low risk | A Construction Management Plan | Negligible |
| Ecological effects at existing receptors | Significant with a low risk | A Construction Management Plan | Negligible |
| **Post-Completion Stage** | | | |
| Changes in air quality at existing sensitive receptor locations due to operational phase traffic | Negligible to Minor adverse | Implementation of a green travel plan | Negligible to minor adverse |
| Air quality at proposed sensitive receptor locations due to operational phase traffic | Negligible | Implementation of a green travel plan | Negligible |

## 6.8 CUMULATIVE EFFECTS

6.4.15 The traffic flow information for the cumulative effects assessment (post-completion stage) considers both the Land East of Bloxham Road Scheme committed development and the Barwood Scheme Proposed Development. The Barwood Scheme tested at 400 dwellings, exceeds that set out in the Cherwell Local Plan main modifications at 150 dwellings, and represents a worst case scenario approach to assessment.

6.8.1 The impact assessment has been carried out for the representative existing sensitive receptor locations (ESR 1 to ESR 11). Table 6.26 shows the changes in pollutant concentrations between the 2022 future year 'without development' and 'with development' scenarios. The uncorrected $PM_{10}$ concentrations are included in Appendix 6.6 and corrected $NO_2$ predicted concentrations are detailed in Appendix 6.7.

**Table 6.26 - Predicted $NO_2$ and $PM_{10}$ Concentrations at Existing Sensitive Receptor Locations for 2022 'Without Development' and 'With Development' Scenarios**

| Receptor | Level of Development | Calculated Annual Mean Concentrations (µg/m$^3$) | | | |
|---|---|---|---|---|---|
| | | $NO_2$ (Corrected) | Change in $NO_2$ / Impact Significance | $PM_{10}$ (Uncorrected) | Change in $PM_{10}$ / Impact Significance |
| ESR 1 | Without development | 24.22 | | 20.40 | |
| | With development | 24.89 | | 20.53 | |
| | *With – without development* | *+0.67 µg/m$^3$* | *Small / Negligible* | *+0.13 µg/m$^3$* | *Imperceptible / Negligible* |
| ESR 2 | Without development | 27.95 | | 20.99 | |
| | With development | 24.53 | | 20.10 | |
| | *With – without development* | *-3.42 µg/m$^3$* | *Medium / Negligible* | *- 0.89 µg/m$^3$* | *Small / Negligible* |
| ESR 3 | Without development | 25.75 | | 20.64 | |
| | With development | 26.62 | | 20.80 | |
| | *With – without development* | *+ 0.87 µg/m$^3$* | *Small / Negligible* | *+0.16 µg/m$^3$* | *Imperceptible / Negligible* |
| ESR 4 | Without development | 31.91 | | 21.65 | |

| Receptor | Level of Development | Calculated Annual Mean Concentrations (µg/m³) | | | |
|---|---|---|---|---|---|
| | | **$NO_2$ (Corrected)** | **Change in $NO_2$ / Impact Significance** | **$PM_{10}$ (Uncorrected)** | **Change in $PM_{10}$ / Impact Significance** |
| | With development | 32.68 | | 21.83 | |
| | *With – without development* | *+ 0.77 µg/m³* | *Small / Negligible* | *+ 0.18 µg/m³* | *Imperceptible / Negligible* |
| ESR 5 | Without development | 44.81 | | 23.02 | |
| | With development | 46.02 | | 23.36 | |
| | *With – without development* | *+ 1.21 µg/m³* | *Small / Minor Adverse* | *+ 0.34 µg/m³* | *Imperceptible / Negligible* |
| ESR 6 | Without development | 28.65 | | 20.87 | |
| | With development | 28.90 | | 20.92 | |
| | *With – without development* | *+ 0.25 µg/m³* | *Imperceptible / Negligible* | *+ 0.05 µg/m³* | *Imperceptible / Negligible* |
| ESR 7 | Without development | *27.69* | | *20.94* | |
| | With development | *29.65* | | *21.40* | |
| | *With – without development* | *+1.96 µg/m³* | *Small / Negligible* | *+0.46 µg/m³* | *Small / Negligible* |
| ESR 8 | Without development | *42.14* | | *22.51* | |
| | With development | *44.21* | | *23.08* | |
| | *With – without development* | *+2.07 µg/m³* | *Medium / Moderate Adverse* | *+0.57 µg/m³* | *Small / Negligible* |
| ESR 9 | Without development | *26.17* | | *20.48* | |
| | With development | *26.31* | | *20.50* | |
| | *With – without development* | *+0.14 µg/m³* | *Imperceptible / Negligible* | *+0.02 µg/m³* | *Imperceptible / Negligible* |
| ESR 10 | Without development | *31.60* | | *20.53* | |
| | With development | *32.32* | | *20.70* | |
| | *With – without development* | *+0.72 µg/m³* | *Small / Negligible* | *+0.17 µg/m³* | *Imperceptible / Negligible* |
| ESR 11 | Without | *39.95* | | *22.04* | |

| Receptor | Level of Development | Calculated Annual Mean Concentrations (µg/m³) | | | |
|---|---|---|---|---|---|
| | | $NO_2$ (Corrected) | Change in $NO_2$ / Impact Significance | $PM_{10}$ (Uncorrected) | Change in $PM_{10}$ / Impact Significance |
| | development | | | | |
| | With development | *40.96* | | *22.32* | |
| | *With – without development* | *+1.01 µg/m³* | *Small / Minor Adverse* | *+0.28 µg/m³* | *Imperceptible / Negligible* |
| ** Change in $NO_2$ concentration and impact significance determined using the air quality significance criteria detailed in Sections 6.2.58 to 6.2.63.* | | | | | |

*Scenario 4: Future Year 2022 'With Development' (including Barwood Scheme)*

6.8.2 The 2022 'with development' annual mean $NO_2$ concentrations (corrected) are predicted to range from 24.53 to 46.02µg/m³ for the eleven existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m³) is predicted to occur at ESR 5, ESR 8 and ESR 11.

6.8.3 ESR 5 and ESR 8 are located at a junction (A361 Bloxham Road / B4100 Oxford Road / A361 South Bar Street) where $NO_2$ diffusion tube data, for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at these existing sensitive receptor locations.

6.8.4 ESR 12 (2 Horse Fair) is located on the A361 Horse Fair where $NO_2$ diffusion tube data (within 3m of the kerb), for 2013, has shown an exceedance of the annual mean objective. Elevated $NO_2$ concentrations would, therefore, be expected at this existing sensitive receptor location.

6.8.5 It is important to note that, in order to provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality and emission factors by 2022. Therefore, the predicted $NO_2$ concentrations for all receptor locations assume a worst case scenario.

6.8.6 The 2022 'with development' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range from 20.10 to 23.36µg/m³ for the eleven existing sensitive receptor

locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/m$^3$) is not predicted to occur.

**Assessment of Significance**

***Existing Sensitive Receptor Locations***

6.8.7 Using the air quality significance criteria, detailed in Sections 6.2.58 to 6.2.63 of this report, the impacts on air quality due to changes in pollutant concentrations can be assessed at the eleven existing sensitive receptor locations considered.

**$NO_2$ Concentrations**

6.8.8 For 2022, all of the existing receptor locations, with the exception of ESR 2, 6, 8 and 9, are predicted to experience a small increase in $NO_2$ concentration as a result of the Proposed Development (i.e. an increase of between 0.4 and 2.0µg/m$^3$, in accordance with Table 6.13). ESR 2 is predicted to experience a medium decrease (i.e. a decrease of between 2.0 and 4.0µg/m$^3$). ESR 6 and 9 are predicted to experience an imperceptible increase (i.e. an increase of less than 0.40µg/m$^3$). ESR 8 is predicted to experience a medium increase, but at a change of 2.07µg/m$^3$ the receptor falls only just within the medium increase range (i.e. an increase of between 2.0 and 4.0µg/m$^3$).

6.8.9 All existing receptor locations, with the exception of ESR 5, 8 and 11, are predicted to experience a negligible impact as a result of the Proposed Development, in accordance with Table 6.14. ESR 5 and 11 are predicted to experience a minor adverse impact. ESR 8 is predicted to experience a moderately adverse impact. The moderately adverse impact predicted for ESR 8 is due to the predicted medium increase in $NO_2$ concentration. However, as stated above, the change in $NO_2$ concentration predicted for ESR 8 falls just within the medium category. Furthermore, the impact at this receptor location is minor adverse when the Proposed Development is considered without the proposed Barwood Scheme.

6.8.10 Predicted $NO_2$ concentrations are below the objective / limit values for eight of the eleven existing sensitive receptors considered. Exceedances of the $NO_2$ annual

mean objective value are predicted to occur for ESR 5, 8 and 11. For ESR 5 and 8, exceedances of the $NO_2$ annual mean air quality objective of 40µg/m$^3$ are predicted for, both without and with the development in place. The Proposed Development does not lead to an exceedance on any of the air quality objectives.

6.8.11 For ESR 11, an exceedance of the $NO_2$ annual mean air quality objective of 40µg/m$^3$ are predicted for the 2022 with development scenario only. However, it is important to note that the predicted concentration for the 2022 without development scenario is very close to the 40µg/m$^3$ objective level (i.e. 39.95 µg/m$^3$).

6.8.12 All existing receptor locations are considered moderately sensitive, with the exception of ESR 7, in accordance with the criteria detailed in Table 6.15. ESR 7 is a residential care home (85 Bloxham Road) and is considered to be highly sensitive. Eight of the eleven receptors considered are predicted to experience a 'negligible' impact on $NO_2$ concentrations as a result of the Proposed Development when the magnitude of impact is considered along with the sensitivity of the receptor, in accordance with Table 6.16.

6.8.13 The exceptions to this are ESR 5, 8 and 11. The increases in $NO_2$ concentration in 2022, as a result of the Proposed Development, are small (i.e. there will only be an increase of between 0.4 and 2µg/m$^3$) for ESR 5 and 11. Therefore, these receptor locations are predicted to experience a 'minor adverse' impact, due to the predicted $NO_2$ concentrations being above, or very close to, the annual mean objective for both the 'without development' and 'with development' scenarios.

6.8.14 The increase in $NO_2$ concentration in 2022, as a result of the Proposed Development, just falls within the medium category (i.e. an increase of between 2.0 and 4.0 µg/m$^3$) for ESR 8. Therefore, this receptor location is predicted to experience a 'moderate adverse' impact, due to the predicted $NO_2$ concentrations being above the annual mean objective for both the 'without development' and 'with development' scenarios.

6.8.15 It is important to note that, in order to provide a robust assessment, base year (i.e. 2013) background concentrations and emission factors have been applied to the future year model scenarios. This is considered to be a conservative approach, as it is likely that there will some improvement in background air quality and emission factors by 2022. Therefore, the predicted $NO_2$ concentrations for all receptor locations assume a worst case scenario.

**$PM_{10}$ Concentrations**

6.8.16 For 2022, all existing receptor locations, with the exception of ESR 2, 7 and 8, are predicted to experience an imperceptible increase in $PM_{10}$ concentrations as a result of the Proposed Development (i.e. an increase of less than 0.4µg/$m^3$, in accordance with Table 6.13). ESR 2 is predicted to experience a small decrease as a result of the Proposed Development (i.e. a decrease of between 0.4 and 2.0µg/$m^3$), due to the realignment of Bloxham Road. ESR 7 and 8 are predicted to experience a small increase as a result of the Proposed Development (i.e. an increase of between 0.4 and 2.0µg/$m^3$). All existing receptor locations are, therefore, predicted to experience a negligible impact as a result of the Proposed Development, in accordance with Table 6.14.

6.8.17 All predicted $PM_{10}$ concentrations are well below the objective / limit values and no exceedances of the $PM_{10}$ annual mean air quality objective of 40µg/$m^3$ are predicted to occur in 2022 for both the 'without development' and 'with development' scenarios.

6.8.18 All existing receptor locations are considered moderately sensitive, with the exception of ESR 7, in accordance with the criteria detailed in Table 6.15. ESR 7 is considered to be highly sensitive. All of the eleven receptors considered are predicted to experience a 'negligible' impact on $NO_2$ concentrations as a result of the Proposed Development when the magnitude of impact is considered along with the sensitivity of the receptor, in accordance with Table 6.16.

6.8.19 ***Proposed Sensitive Receptor Locations***

6.8.20 Air pollutant concentrations have been modelled for three proposed receptor locations for the 2022 'with development' scenarios, as detailed in Table 6.27. The uncorrected $PM_{10}$ concentrations are included in Appendix 6.6, and the corrected $NO_2$ concentrations are included in Appendix 6.7.

**Table 6.27 - Predicted Pollutant Concentrations at Proposed Receptor Points for 2022 'With Development' Scenarios**

| Proposed Receptor Point | Calculated Annual Mean Concentrations (µg/m³) | |
|---|---|---|
| | $NO_2$ (Corrected) | $PM_{10}$ (Uncorrected) |
| | 2022 | 2022 |
| PR 1 | 26.82 | 20.41 |
| PR 2 | 32.83 | 21.56 |
| PR 3 | 21.59 | 19.86 |

*Scenario 4: Future Year 2022 With Development (including Barwood Scheme)*

6.8.21 The 2022 'with development' annual mean $NO_2$ concentrations (corrected) are predicted to range between 21.59 and 32.83µg/m³ for the three proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $NO_2$ (40µg/m³) is not predicted to occur.

6.8.22 The 2022 'with development' annual mean $PM_{10}$ concentrations (uncorrected) are predicted to range between 19.86 to 21.56µg/m³ for the three proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{10}$ (40µg/m³) is not predicted to occur.

**Summary of effects (cumulative impact assessment)**

6.7.8 The potential effects, of the Proposed development on air quality, identified are summarised in Table 6.28 below:

**Table 6.28: Summary of Effects (cumulative impact assessment)**

| Potential effect | Significance (pre-mitigation) | Mitigation measure | Significance of residual effect |
|---|---|---|---|
| **Post-Completion Stage** | | | |
| Changes in air quality at | Negligible to Moderate | Implementation of a green | Negligible to moderate adverse |

| | | | |
|---|---|---|---|
| existing sensitive receptor locations due to operational phase traffic | adverse | travel plan | |
| Air quality at proposed sensitive receptor locations due to operational phase traffic | Negligible | Implementation of a green travel plan | Negligible |