

LAND AT BIRD IN EYE FARM, UCKFIELD

Proposed Residential Development

**Air Quality Assessment and Emissions Mitigation
Assessment**

Prepared for: Croudace Homes Ltd

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by Croudace Homes Ltd to undertake an air quality assessment in support of a planning application for a proposed residential development comprising up to 290 dwellings ('Proposed Development'), on land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield (the 'Site').

The Site is located at the approximate centroid National Grid Reference (NGR): x548350, y120750. The Site is bounded by:

- the B2102 Bird in Eye Hill to the north, with a mixture of residential properties and agricultural land beyond;
- green open space and agricultural land to the east;
- green open space, agricultural land and woodland to the south; and
- Uckfield Hospital immediately to the west with the residential dwellings of Uckfield.

Primary vehicular access to the Site will be via the existing access road off the B2102 Bird in Eye Hill.

1.1 Scope of Assessment

It is understood that an air quality assessment is required to assess potential air quality effects and design constraints associated with the construction and operation of the Proposed Development.

The scope of the assessment was as follows:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Construction Phase Assessment – Identification and assessment of potential air quality effects associated with the construction phase of the Proposed Development;
- Operational Phase Assessment – Identification of air quality effects and design constraints associated with the operational phase of the Proposed Development; and
- Mitigation Measures – as required and inclusive of an emissions mitigation assessment.

2.0 RELEVANT AIR QUALITY LEGISLATION AND GUIDANCE

2.1 Legislative Context

2.1.1 Air Quality Standards

The Air Quality Standards Regulations 2010¹ (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC)², and the Fourth Daughter Directive (2004/107/EC)³ within UK legislation, in order to align and bring together in one statutory instrument the Government's obligations. The AQSR includes Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment. Limit values are legally binding and are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites). Compliance is regulated at a national level (based upon a series of zones/agglomerations).

The UK nationally has failed to meet the Limit Values, as outlined in the Ambient Air Quality Directive (2008/50/EC), for nitrogen dioxide (NO₂) by the 2010 target date. As a result, the Government has had to submit time extension applications for compliance with the EU Limit Values, which has since passed and its continued failure to achieve these limits is currently giving rise to infringement procedures being implemented. In July 2017, the Government published its plan for tackling roadside NO₂ concentrations⁴, to achieve compliance with EU Limit Values. This sets out Government policies for bringing NO₂ concentrations within statutory limits in the shortest time period possible.

In the interim period the UK has formally left the EU, however despite this, EU rules and regulations referred above have subsequently been written into UK law and are still relevant – although there is uncertainty as to who will enforce these requirements domestically.

2.1.2 Air Quality Strategy

Irrespective of the above, the UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality. The latest Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland was published in 2007⁵. The AQS provides the over-arching strategic framework for air quality management in the UK and contains non-statutory national air quality standards and objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment, taking into account epidemiological evidence and international regulations, as well as economic efficiency, practicability and technical feasibility. There is no legal requirement to meet these objectives except where they mirror an equivalent legally binding Limit Value as prescribed within EU legislation, however compliance is regulated at a local level by local planning authorities.

The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period – herein referred to as relevant exposure. Table 2-2 provides an indication of those locations.

The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 2-1.

¹ The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

² 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.

³ Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004.

⁴ Defra, DfT (2017), UK plan for tackling roadside nitrogen dioxide concentrations.

⁵ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra. July 2007.

Table 2-1
Relevant Ambient AQALs

Pollutant	Standard ($\mu\text{g}/\text{m}^3$)	Measured As	Equivalent percentile
Nitrogen Dioxide (NO_2)	40	Annual Mean	-
	200	1-hour Mean	99.79 th percentile of 1-hour means (equivalent to 18 1-hour exceedences)
Particles (PM_{10})	40	Annual Mean	-
	50	24-hour mean	90.41 th percentile of 24-hour means (equivalent to 35 24-hour exceedences)
Particles ($\text{PM}_{2.5}$)	25	Annual Mean	-

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	Relevant Locations	AQALs should apply at	AQALs should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.2 Local Air Quality Management

As reinforced within the AQS, Part IV of the Environment Act 1995 induces a statutory duty for local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

After a high number of declarations across the UK, it has become standard practice for planning authorities to require an air quality assessment to be carried out for a proposed development.

2.3 Clean Air Strategy

The Clean Air Strategy (CAS)⁶, published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.4 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10µm (i.e. greater than PM₁₀) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.5 Planning Policy

2.5.1 National Policy

The 2019 update to the National Planning Policy Framework (NPPF) describes the policy context in relation to pollutants including air pollutants:

"Para 170: Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of [...] air [...] pollution [...]. Development should, wherever possible, help to improve local environmental conditions such as air [...] quality [...]"

"Para 180: Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

Specifically, within the context of development control:

"Para 181: Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

⁶ The Clean Air Strategy, Defra. January 2019.

The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values [...] It is important that the potential impact of new development on air quality is taken into account [...] where the national assessment indicates that relevant limits have been exceeded or are near the limit.”

“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 impact in an 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).”

The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that *“assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality [...] Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact”*.

The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this assessment.

2.5.2 Local Policy

Wealden District Council's (WDC's) Core Strategy Local Plan⁷ was adopted in 2013 and is the main document to guide new development within the area up until 2027. No policies contained within the Core Strategy Local Plan relate to air quality.

2.6 Assessment Guidance

2.6.1 Sussex-air Air Quality Partnership: Air Quality and Emissions Mitigation Guidance for Sussex

The 'Air quality and emissions mitigation guidance for Sussex'⁸ has been adopted by the Sussex-air partnership to provide guidance on the requirements for and contents of an air quality assessment, including recommended mitigation measures.

As the proposals comprise up to 290 residential units, the Proposed Development is classed as a 'Major' development. Therefore, an air quality and supporting mitigation assessment are both required.

2.6.2 Local Air Quality Management Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (LAQM.TG(16))⁹ was published for use by local authorities in their LAQM Review and Assessment work. The document provides key guidance in aspects of air quality assessment, including screening, model verification, use of monitoring data, and use of background data that are applicable to all air quality assessments.

⁷ Wealden District Council, Core Strategy Local Plan, Adopted 2013.

⁸ Sussex-air Air Quality Partnership, Air Quality and Emissions Mitigation Guidance for Sussex (2020), 2020.

⁹ Local Air Quality Management Technical Guidance 16, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland, April 2021.

2.6.3 Environmental Protection UK and Institute of Air Quality Management Guidance

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance¹⁰ to help ensure that air quality is appropriately accounted for in the development control process. The guidance clarifies when an air quality assessment should be undertaken, as well as the likely proportional scope, with reference to indicative screening criteria, and provides a significance criterion for use to evaluate and describe potential developmental impacts and effects.

2.6.4 Construction and Demolition Dust Guidance

Guidance on the assessment of dust from demolition and construction has been published by the IAQM¹¹. The guidance provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities to identify appropriate mitigation measures that are defined within further IAQM guidance.

¹⁰ EPUK and IAQM, Land-Use Planning and Development Control: Planning for Air Quality', v1.2 2017.

¹¹ Institute of Air Quality Management (IAQM), Guidance on the assessment dust from demolition and construction (2016).

3.0 ASSESSMENT METHODOLOGY

3.1 Construction Phase

The assessment has been undertaken in accordance with IAQM guidance. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- track-out.

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM₁₀; and
- harm to ecological receptors.

The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the site activities associated with the construction phase of the scheme. A detailed assessment is required where a:

- human receptor is located within 350m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the site entrance(s); and/or
- ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the site entrance(s).

The dust emission class (or magnitude) for each activity is determined on the basis of the guidance, indicative thresholds and professional judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application, residual effects are considered to be 'not significant'.

3.2 Operational Phase

In order to appropriately assess road traffic impacts associated with the operation of the Proposed Development, as well as the suitability of the Site for residential purposes, detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5.0.0.1 dispersion model. This modelling exercise has focussed on concentrations of NO₂, PM₁₀ and PM_{2.5} (the pollutants of principal concern arising from road traffic) for the following scenarios:

- 2019 Base Case (2019 BC) – Without development base flows for the year (2019);
- 2028 Do Minimum (2028 DM) – Without development flows for the proposed year of opening (2028), inclusive of any relevant committed development flows; and
- 2028 Do Something (2028 DS) – 'Do Minimum' flows, plus all trips associated with the Proposed Development flows for the proposed year of opening (2028).

For the above future year scenarios (2028), concurrent emission factors and background pollutant concentrations have been used.

Details of model inputs are discussed in turn, below, and in Appendix A.

3.2.1 Traffic Inputs

The ADMS-Roads assessment incorporates numbers of road traffic vehicles, vehicle speeds on the local roads and the composition of the traffic fleet.

Traffic data was provided by Bellamy Roberts – the appointed transport consultant. This data has principally informed the spatial extent and inclusion of initial road links within the assessment (as traffic data is a principal input into an ADMS-Roads assessment). The extent of road links for input to the assessment were subsequently refined through application of the indicative screening criteria provided within EPUK & IAQM guidance in relation to developmental-generated flows. Where identified, adjoining road links (previously screened out from requiring assessment) were also modelled in full, to ensure a cumulative/robust prediction of concentrations at relevant receptor locations, despite experiencing insignificant developmental flows.

Traffic speeds were modelled at the relevant speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue in accordance with LAQM.TG(16).

The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra¹² has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

Details of the traffic flows used in this assessment are provided in Table A-2 of Appendix A, whilst the modelled roads in relation to the Site are presented in Figure 3-2.

3.2.2 Meteorological Data

To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses hourly sequential meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using 2019 data from Herstmonceux West End meteorological station, located approximately 16km to the south-east of the Site – the closest representative meteorological station relative to the Site.

LAQM.TG(16) recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Herstmonceux West End meteorological station includes 8,760 lines of usable hourly data for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise.

A wind rose is presented in Figure 3-1.

¹² Defra, EFT v10.1 (2020). <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>.

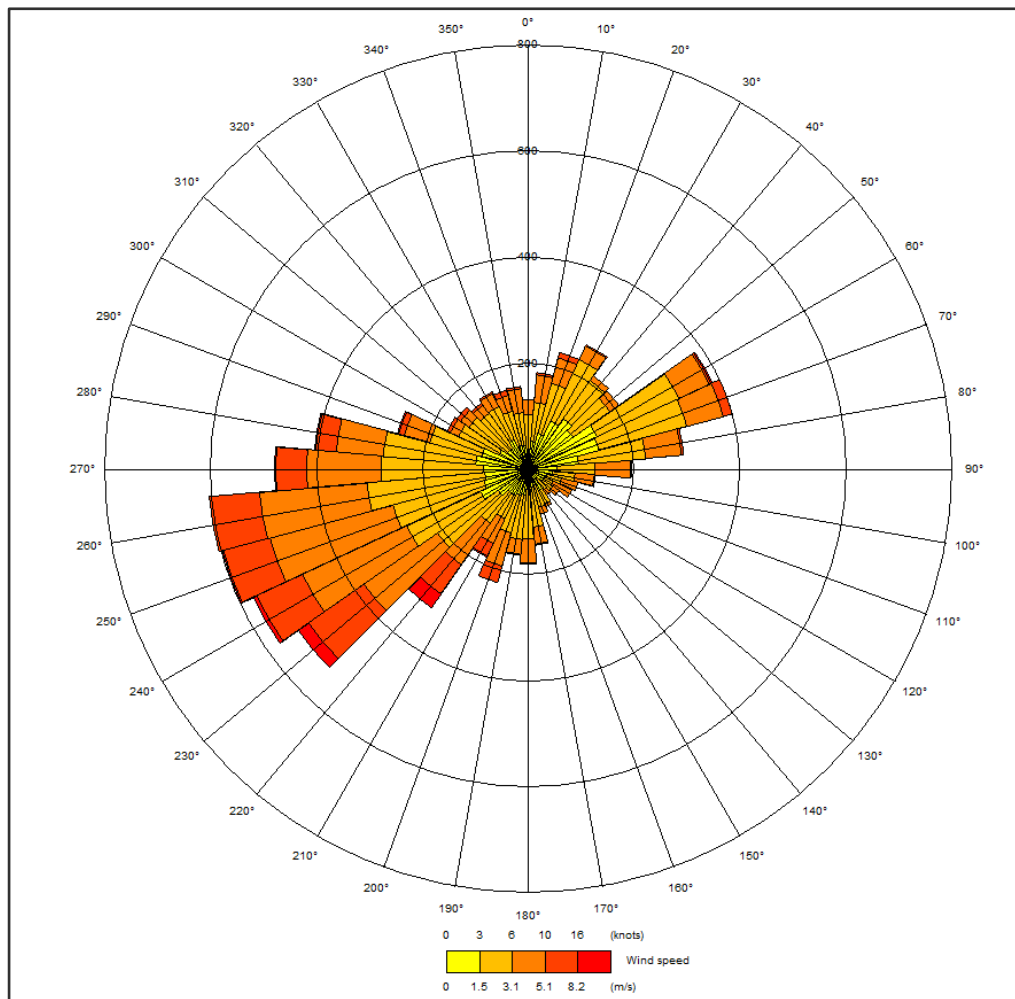


Figure 3-1
Wind Rose for Herstmonceux West End Meteorological Station (2019)

3.2.3 Background Concentrations

In the absence of locally representative background monitoring sites, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year)¹³, based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 4.1.3.

No adjustment for background concentration variability with height has been made.

3.2.4 Sensitive Receptors

Human receptors considered in the assessment of road traffic emissions are shown Table 3-1, whilst their locations are illustrated in Figure 3-2. Receptors R1 – R11 are representative of worst-case exposure locations at existing receptors within the development locale, relative to the affected road network. New receptors introduced as a result of the Proposed Development, NR1 – NR4, are selected as the locations of worst-case exposure within the Site relative to the surrounding modelled road network and proposed Site layout.

Receptor locations represent relevant exposure – in accordance with LAQM.TG(16), as presented in Table 2-2. All receptors were considered in relation to exposure at breathing height relative to the adjacent modelled road.

¹³ Background mapping data for local authorities – <http://uk-air.defra.gov.uk/data/laqm-background-home>.

Table 3-1
Human Receptor Locations Considered

Receptor	X	Y	Height (m)
Existing Receptors			
R1	548430	120729	1.5
R2	548341	120878	1.5
R3	548327	120922	1.5
R4	548079	120834	3.5
R5	547919	120772	1.5
R6	547541	120703	1.5
R7	547359	120719	1.5
R8	547306	120810	3.5
R9	547274	120942	3.5
R10	547226	120999	3.5
R11	546370	121004	1.5
New Receptors			
NR1	548489	120781	1.5
NR2	548577	120672	1.5
NR3	548261	120809	1.5
NR4	548471	120619	1.5

3.2.5 Model Outputs

The background pollutant values discussed in Section 4.1.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} for each respective scenario.

For the prediction of annual mean NO₂ concentrations at receptor locations, the road NO_x contributions (adjusted as per Appendix A) have been converted to total NO₂ following the methodology in LAQM.TG(16) using the latest version of Defra's NO_x to NO₂ conversion tool (v8.1)¹⁴. The modelled NO₂ road contribution was then added to the appropriate NO₂ background concentration value to obtain an overall total annual mean NO₂ concentration.

For the prediction of short-term NO₂ impacts, LAQM.TG(16) advises that it is valid to assume that exceedences of the 1-hour mean AQAL for NO₂ are unlikely to occur where the annual mean NO₂ concentration is <60µg/m³. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations.

For the prediction of short-term PM₁₀, LAQM.TG(16) provides an empirical relationship between the annual mean and the number of exceedences of the 24-hour mean AQAL for PM₁₀ that can be calculated as follows:

$$\text{No. 24-hour mean exceedences} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

This relationship has thus been adopted to determine whether exceedences of the short-term PM₁₀ AQAL are likely in this assessment.

¹⁴ Defra NO_x to NO₂ Calculator v8.1 (2020), available at <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>.

Verification of the ADMS-Roads assessment has been undertaken, as per Appendix A. All results presented in the assessment are those calculated following the process of model verification, using an adjustment factor of 1.435 for NO₂, PM₁₀ and PM_{2.5}.

3.2.6 Assessing Significance

Guidance for determining the significance of a development's impact on local air quality is provided by EPUK and IAQM.

Whilst describing the developmental impact at a specific receptor, the resultant total concentration as well as the magnitude of change in relation to respective AQALs are both considered – using the approach detailed in Table 3-2.

Table 3-2
EPUK & IAQM Impact Descriptors for Receptors

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration relative to AQAL			
	1% ^(A)	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
AQAL = Air Quality Assessment Level, which may be an AQS objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.				
^(A) Changes < 0.5% will be described as Negligible.				

Following derivation of impacts at all receptor locations assessed, the overall significance of the developmental 'effect' is determined based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the Proposed Development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the Proposed Development has adopted best practice to eliminate and minimise emissions.

3.2.7 Uncertainty

Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest publicly available local monitoring data, as collected by WDC.

In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data¹⁵. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 10.1 utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra.

Further to this, to help ameliorate any local uncertainties with regard to representativity of future national projections (as embedded within the EFT v10.1 and Defra supplied background concentration estimates), the

¹⁵ Carslaw, et al. (2011). Trends in NO_x and NO₂ emissions and ambient measurements in the UK.

assessment has included two further sensitivity scenarios to minimise uncertainty of modelled predictions i.e. no future projection of emission factors/background concentrations has been adopted:

- 2019 Do Minimum (2019 DM) – 2028 DM flows, processed using 2019 emission factors and background concentration estimates; and
- 2019 Do Something (2019 DS) – 2028 DS flows, processed using 2019 emission factors and background concentration estimates.

This represents an overly conservative approach, based on a series of worst-case parameters. Details of the sensitivity assessment are provided in Appendix B.

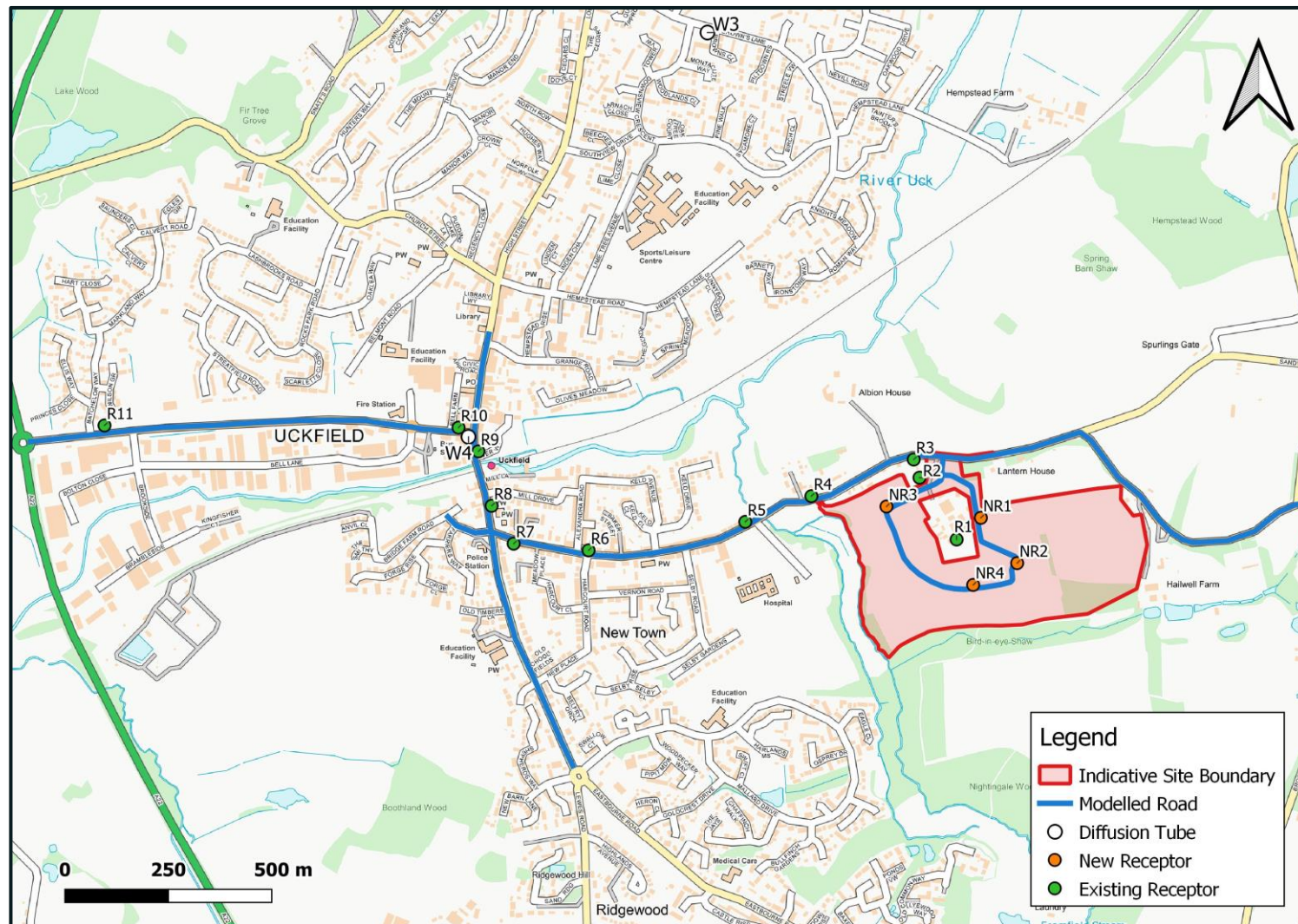


Figure 3-2
Modelled Road Links, Receptors and Monitoring Locations

4.0 BASELINE ENVIRONMENT

4.1 Baseline Air Quality

4.1.1 LAQM Review and Assessment

WDC, in fulfilment of statutory requirements, has conducted an on-going exercise to review and assess air quality within their administrative area. The latest publicly available LAQM report for WDC at the time of writing is the 2020 Annual Status Report¹⁶ (ASR). The monitoring data published therein has therefore been used for the purposes of informing this assessment.

WDC do not presently have any declared AQMAs.

4.1.2 Review of Air Quality Monitoring

Automatic Air Quality Monitoring

The closest automatic monitor in relation to the Site is located approximately 5km away (Wealden – Isfield), operated by WDC which monitors ozone alone. The next nearest automatic monitor is located approximately 20km away. Therefore, given the separation distances between the automatic monitors and the Site, concentrations recorded at these locations have not been considered further, as they are not likely to be representative of Site conditions.

Passive Diffusion Tube Monitoring

Passive NO₂ diffusion tube monitoring is currently undertaken by WDC within the district, at numerous locations, in fulfilment of their statutory LAQM obligations.

The details and results of the monitoring locations of relevance to the Site (i.e. located within 2km of the Site) are presented in Table 4-1 and Table 4-2 respectively, whilst their locations are illustrated in Figure 3-2. All monitoring data presented has been ratified by WDC.

Table 4-1
LAQM Diffusion Tube Monitoring Sites: Details

Site ID	Site Location	Site Type	NGR (m)		Height (m)	Within AQMA	Distance to Site (km)
			X	Y			
W3	Uckfield Background	Urban Background	547828	121954	2.5	No	1.2
W4	Uckfield Town Centre	Roadside	547250	120977	2.5	No	0.9

Table 4-2
LAQM Diffusion Tube Monitoring Sites: Results

Site ID	2019 Data Capture %	Annual Mean NO ₂ Concentration (µg/m ³)				
		2015	2016	2017	2018	2019
W3	91.67	14.6	14.8	15.6	14.9	13.4
W4	91.67	29.9	35.0	37.1	36.7	33.6

¹⁶ Wealden District Council, 2020 Air Quality Annual Status Report (ASR), July 2020.

As shown in Table 4-2, W3 and W4 have historically recorded annual mean NO₂ concentrations below the AQAL (40µg/m³) across the period assessed.

Site ID W4 recorded an annual mean NO₂ concentration of 33.6µg/m³ in 2019. W4 is located roadside of the B2102 and is therefore believed to be representative of anticipated conditions at the Site, given its roadside proximity to the B2102. However, the proposed residential dwellings are situated at a greater separation distance from the B2102 in comparison to W4. As such, anticipated Site concentrations are expected to be lower than those recorded at W4.

Site ID W3 is an urban background site and recorded an annual mean NO₂ concentration of 13.4µg/m³ in 2019.

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean objective for NO₂ is only likely to occur where annual mean concentrations are 60µg/m³ or above at a location of relevant exposure (Table 2-2). This indicates that an exceedence of the 1-hour mean objective is unlikely to have occurred at these sites between 2015 and 2019.

4.1.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution which is routinely used to support LAQM requirements and air quality assessments. The data sets include semi-empirical annual average concentration estimates for NO_x, NO₂, PM₁₀ and PM_{2.5} using a base year of 2018 (the year in which comparisons between modelled and monitoring are made)¹⁷.

Annual mean background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} have been obtained from the Defra published background maps (2018 base year), based on the 1km grid squares which cover the modelled area. The Defra mapped background concentrations for the baseline year of 2019 and expected development opening year (2028) are presented in Table 4-3.

All of the mapped background concentrations presented are well below the respective annual mean AQALs.

Table 4-3
Defra Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration (µg/m ³)			
		NO _x	NO ₂	PM ₁₀	PM _{2.5}
548500, 120500	2019	11.5	8.8	13.6	9.1
	2028	8.9	7.0	12.5	8.3
547500, 120500	2019	13.1	10.0	14.4	9.8
	2028	10.0	7.7	13.3	8.9
546500, 121500	2019	12.1	9.3	14.0	9.5
	2028	8.7	6.8	12.9	8.6
AQAL		-	40	40	25

¹⁷ Defra Background Maps (2018 Reference)

5.0 CONSTRUCTION PHASE

This section presents the potential air quality impacts and effects associated with the construction of the Proposed Development.

5.1 Construction Dust Assessment

Where figures relating to area of the site, volume of the site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

5.1.1 Assessment Screening

As shown in Figure 5-1, there are 'human receptors' within 350m of the Site but no designated habitat sites within 50m of the Site boundary or up to 500m of the Site entrance(s) / 50m of the roads anticipated to witness construction traffic movements. Therefore, an assessment of construction dust on human receptors only is required.

5.1.2 Potential Dust Emissions Magnitude

Demolition

The Site is currently an agricultural field and does not contain any buildings or structures. As such, no further consideration of demolition impacts is required.

Earthworks

Site earthworks are required over an area greater than 10,000m². However, due to the typical phased nature of the construction of residential schemes, the total Site area at any given time is not expected to be greater than 10,000m². In addition, it is believed that 5 – 10 heavy earth moving vehicles are considered to be required on Site at once. The dust emission magnitude for earthworks is therefore initially considered to be 'medium'.

Construction

Construction works are required for a building volume greater than 100,000m³. However, due to the typical phased nature of the construction of residential schemes, construction activities at the Site will total a building volume expected to be no greater than 100,000m³ at any given time. As such, the dust emission magnitude for construction is therefore initially considered to be 'medium'.

Trackout

Construction vehicles are expected to access the Site via the existing entrance, off the B2102 Bird in Eye Hill to the north of the Site. No details are available at the time of assessment on the number of additional HDV movements associated with construction works in each phase, however, given the scale and nature of works required, it is considered unlikely that >50 HDV outward movements will occur in any worst-case day. In addition, due to the proposed construction of internal Site roads and the phased approach to construction, the unpaved road length is likely to be <100m at any one time. The dust emission magnitude for trackout is therefore initially considered to be 'medium'.

Summary

A summary of the dust emission magnitude for the assessed activities is detailed in Table 5-1.

Table 5-1
Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Medium
Trackout	Medium

5.1.3 Sensitivity of the Area

Dust Soiling Impacts

There are considered to be 1-10 residential units (high sensitivity) within 20m of the Site boundary. In addition, there are considered to be 10-100 residential units (high sensitivity receptors) within 50m of the Site boundary. Furthermore, there are approximately 1-10 residential properties (high sensitivity) located less than 20m from sections of access roads (B2102 Bird in Eye Hill) that are within 200m from the Site entrance - commensurate of a medium site¹⁸.

The sensitivity of the area with respect to dust soiling effects on people and property in relation to earthworks, construction and trackout is therefore considered to be 'medium'.

Human Health Impacts

The maximum 2019 mapped background PM₁₀ concentration (2018 base year) for the 1km² grid squares centred on the Proposed Development is estimated to be 13.6µg/m³ (i.e. falls into the <24µg/m³ class). As discussed in Section 4.1, no local particulate background monitoring exists within the development locale.

Given the above information regarding the number of residential receptors within 20m of the Site boundary and within 20m of Site access roads, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore considered to be 'low'.

Summary

A summary of the sensitivity of the surrounding area is detailed in Table 5-2 whilst the spatial density of nearby receptors is provided in Figure 5-1.

Table 5-2
Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling Impacts	Medium	Medium	Medium
Human Health Impacts	Low	Low	Low

5.1.4 Risk of Impacts

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table 5-3 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

¹⁸ As per the IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction', without site-specific mitigation, trackout may occur along the public highway up to 500m from large sites, 200m from medium sites and 50m from small sites (determined by the calculated trackout dust emission magnitude), as measured from the site exit.

Table 5-3
Risk of Dust Impacts

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling Impacts	Medium Risk	Medium Risk	Low Risk
Human Health Impacts	Low Risk	Low Risk	Low Risk

Following the construction dust assessment, the Site is found to be at worse 'Medium Risk' in relation to dust soiling effects on people and property and 'Low Risk' in relation to human health impacts (Table 5-3). However, potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Nonetheless, commensurate with the above designation of dust risk, mitigation measures, as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the Proposed Development are reduced and, where possible, completely removed. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Section 7.2.1, construction dust effects are considered to be 'not significant'.



Figure 5-1
Construction Dust Assessment Buffers

6.0 OPERATIONAL PHASE ASSESSMENT

This section presents the potential air quality impacts and design constraints associated with the operational phase of the Proposed Development.

6.1 NO₂ Modelling Results

Table 6-1 presents the annual mean NO₂ concentrations predicted at all assessed receptor locations for the 2019 BC, 2028 DM and 2028 DS scenarios.

Table 6-1
Predicted Annual Mean NO₂ Concentrations – 2028 Development Opening Year

Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2028 DM	2028 DS			
Existing Receptors						
R1	10.1	7.5	7.9	1.0	19.8	Negligible
R2	12.5	8.4	9.0	1.5	22.5	Negligible
R3	18.6	10.8	11.7	2.2	29.3	Negligible
R4	13.9	8.9	9.4	1.0	23.5	Negligible
R5	18.0	10.9	11.5	1.6	28.8	Negligible
R6	18.5	11.1	11.8	1.6	29.5	Negligible
R7	21.6	12.6	13.2	1.6	33.0	Negligible
R8	18.5	11.4	11.6	0.7	29.0	Negligible
R9	24.7	14.2	14.7	1.1	36.8	Negligible
R10	23.6	14.7	15.0	0.7	37.5	Negligible
R11	15.5	10.0	10.1	0.3	25.3	Negligible
New Receptors						
NR1	-	-	8.7	-	21.8	-
NR2	-	-	8.6	-	21.5	-
NR3	-	-	8.7	-	21.8	-
NR4	-	-	8.4	-	21.0	-

The maximum predicted annual mean NO₂ concentration at all existing receptors during the 2019 BC scenario was at Receptor R9 with a predicted concentration of 24.7µg/m³; this represents 61.8% of the AQAL. Receptor R9 is located at the façade of a residential property adjacent to the B2102 New Town, where dispersion of pollutants is limited by the presence of a canyon. Receptor R9 is located approximately 40m south of W4 (which is situated closer to a junction), which recorded an annual mean NO₂ concentration of 33.6µg/m³ in 2019.

The maximum predicted annual mean NO₂ concentration at existing receptors with the development in place (2028 DS) was at Receptor R10 with a predicted concentration of 15.0µg/m³; this represents 37.5% of the AQAL. Receptor R10 is located at the façade of a residential property adjacent to the B2102 Bell Lane, where vehicles are anticipated

to slow as they approach the junction to B2102 High Street and where dispersion of pollutants is limited by the presence of a canyon.

The greatest change predicted at all receptor locations with the development in place (2028 DM vs. 2028 DS) was at receptor R3 – 2.2% relative to the AQAL (i.e. $+0.9\mu\text{g}/\text{m}^3$). Receptor R3 is located at the façade of a residential property adjacent to Bird in Eye Hill. Despite this localised increase, the predicted resultant concentration is ‘well below’ the annual mean NO_2 AQAL.

In accordance with EPUK & IAQM guidance, the impact of the Proposed Development on annual mean NO_2 concentrations at all existing receptor locations is considered to be negligible. Unmitigated effects associated with annual mean NO_2 concentrations at existing receptor locations are considered to be ‘not significant’.

The maximum predicted annual mean NO_2 concentration (2028 DS) at all receptors newly introduced by the Proposed Development was at Receptor NR1 and NR3, with a predicted concentration of $8.7\mu\text{g}/\text{m}^3$; this represents 21.8% of the AQAL (i.e. ‘well-below’).

The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean NO_2 AQAL are unlikely to occur where annual mean concentrations are $<60\mu\text{g}/\text{m}^3$. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit. Therefore, it is unlikely that an exceedence of the 1-hour mean objective will occur. Effects associated with likely 1-hour mean NO_2 concentrations at all assessed receptor locations (including those on Site) are therefore considered to be ‘not significant’.

6.2 PM_{10} Modelling Results

Table 6-2 presents the annual mean PM_{10} concentrations predicted at all assessed receptor locations for the 2019 BC, 2028 DM and 2028 DS scenarios.

Table 6-2
Predicted Annual Mean PM_{10} Concentrations – 2028 Development Opening Year

Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2028 DM	2028 DS			
Existing Receptors						
R1	13.8	12.7	12.9	0.4	32.3	Negligible
R2	14.3	13.1	13.4	0.6	33.5	Negligible
R3	15.4	14.3	14.6	1.0	36.5	Negligible
R4	14.5	13.4	13.6	0.5	34.0	Negligible
R5	16.0	14.8	15.1	0.8	37.8	Negligible
R6	16.1	14.9	15.2	0.8	38.0	Negligible
R7	16.7	15.5	15.8	0.8	39.5	Negligible
R8	16.1	14.9	15.1	0.3	37.8	Negligible
R9	17.3	16.2	16.4	0.5	41.0	Negligible
R10	17.1	16.6	16.7	0.3	41.8	Negligible
R11	15.3	14.5	14.5	0.2	36.3	Negligible
New Receptors						

Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2028 DM	2028 DS			
NR1	-	-	13.2	-	33.0	-
NR2	-	-	13.2	-	33.0	-
NR3	-	-	13.3	-	33.3	-
NR4	-	-	13.1	-	32.8	-

The maximum predicted annual mean PM₁₀ concentration at all existing receptors during the 2019 BC scenario was at Receptor R9 with a predicted concentration of 17.3µg/m³; this represents 43.3% of the AQAL – therefore ‘well-below’.

The maximum predicted annual mean PM₁₀ concentration at existing receptors with the development in place (2028 DS) was at Receptor R10 with a predicted concentration of 16.7µg/m³; this represents 41.8% of the AQAL.

The greatest change predicted at all receptor locations with the development in place (2028 DM vs. 2028 DS) was at receptor R3 – 1.0% relative to the AQAL (i.e. +0.3µg/m³). Despite this localised increase, the predicted resultant concentration is ‘well below’ the annual mean PM₁₀ AQAL.

In accordance with EPUK & IAQM guidance, the impact of the development on annual mean PM₁₀ concentrations at all assessed existing receptors is considered to be negligible. Given the marginal increase in annual mean PM₁₀ concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM₁₀ AQAL, unmitigated effects associated with annual mean PM₁₀ concentrations at all assessed receptor locations are therefore considered to be ‘not significant’.

The maximum predicted annual mean PM₁₀ concentration (2028 DS) at all receptors newly introduced by the Proposed Development was at Receptor NR3, with a predicted concentration of 13.3µg/m³; this represents 33.3% of the AQAL (i.e. ‘well-below’).

Based upon the maximum predicted annual mean PM₁₀ concentration of 16.7µg/m³ (predicted at Receptor R10 – 2028 DS), this equates to less than 1 day where 24-hour mean PM₁₀ concentrations are predicted to be greater than 50µg/m³. This is well below the 35 permitted exceedences, and therefore the number of maximum exceedences is in compliance with the 24-hour mean AQAL. Effects associated with likely 24-hour mean PM₁₀ concentrations at all assessed receptor locations (including those on Site) are therefore considered to be ‘not significant’.

6.3 PM_{2.5} Modelling Results

Table 6-3 presents the annual mean PM_{2.5} concentrations predicted at all assessed receptor locations for the 2019 BC, 2028 DM and 2028 DS scenarios.

Table 6-3
Predicted Annual Mean PM_{2.5} Concentrations – 2028 Development Opening Year

Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2028 DM	2028 DS			
Existing Receptors						
R1	9.3	8.4	8.5	0.4	34.0	Negligible
R2	9.5	8.6	8.7	0.6	34.8	Negligible

Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)			% Change of AQAL	% of 2028 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2028 DM	2028 DS			
R3	10.2	9.2	9.4	0.9	37.6	Negligible
R4	9.7	8.7	8.9	0.4	35.6	Negligible
R5	10.7	9.8	9.9	0.7	39.6	Negligible
R6	10.8	9.8	10.0	0.7	40.0	Negligible
R7	11.1	10.2	10.3	0.7	41.2	Negligible
R8	10.8	9.8	9.9	0.3	39.6	Negligible
R9	11.5	10.5	10.7	0.5	42.8	Negligible
R10	11.4	10.7	10.8	0.3	43.2	Negligible
R11	10.3	9.5	9.5	0.1	38.0	Negligible
New Receptors						
NR1	-	-	8.7	-	34.8	-
NR2	-	-	8.6	-	34.4	-
NR3	-	-	8.7	-	34.8	-
NR4	-	-	8.6	-	34.4	-

The maximum predicted annual mean PM_{2.5} concentration at existing receptors during the 2019 BC scenario was at Receptor R9 with a predicted concentration of 11.5µg/m³; this represents 46.0% of the AQAL.

The maximum predicted annual mean PM_{2.5} concentration at existing receptors with the development in place (2028 DS) was at Receptor R10 with a predicted concentration of 10.8µg/m³; this represents 43.2% of the AQAL.

The greatest change predicted at all receptor locations with the development in place (2028 DM vs. 2028 DS) was at receptor R3 – 0.9% relative to the AQAL (i.e. +0.2µg/m³). Despite this localised increase, the predicted resultant concentration is ‘well below’ the annual mean PM_{2.5} AQAL.

In accordance with EPUK & IAQM guidance, the impact of the development on annual mean PM_{2.5} concentrations at all assessed existing receptors is considered to be negligible. Given the marginal increase in annual mean PM_{2.5} concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM_{2.5} AQAL, unmitigated effects associated with annual mean PM_{2.5} concentrations at all assessed receptor locations are therefore considered to be ‘not significant’.

The maximum predicted annual mean PM_{2.5} concentration (2028 DS) at all receptors newly introduced by the Proposed Development was at Receptor NR1 and NR3 with a predicted concentration of 8.7µg/m³; this represents 34.8% of the AQAL (i.e. ‘well-below’).

7.0 MITIGATION ASSESSMENT

The following sections detail the Mitigation Assessment that has been undertaken in line with the Sussex-air guidance.

7.1 Damage Cost Calculation

An estimation of the likely financial operational emission impact of the Proposed Development (Damage Cost Calculation) has been undertaken. Pollutant emissions costs associated with additional operational development trips over a 5-year period (from the first year of operation) have been calculated following the Sussex-air guidance to indicate potential mitigation requirements.

The latest version of the EFT (presently v10.1) has been used to determine vehicle emission factors for input into the Damage Cost Calculation. Given that the EFT only extends to the year 2030, subsequent years beyond this, 2031/2032 in this case, have utilised 2030 in the emission calculations. Therefore, the derived financial emission impact of the Proposed Development is likely to be overinflated, as vehicle emission factors post 2030 are expected to decline further as low and zero (tailpipe) emissions technologies permeate the road fleet, which is not accounted for within this calculation.

Development-generated vehicle flows, as input into the Damage Cost Calculation, were provided by Bellamy Roberts – the appointed transport consultant. These vehicle flows relate to the 24-hour AADT associated with the Proposed Development once operational in 2028.

Reference should be made to Table 7-1 and Table 7-2 for a presentation of the Damage Cost Calculation inputs and outputs, respectively.

Table 7-1
Damage Cost Calculation – Inputs

Input Parameter	2028	2029	2030	2031	2032
Total Trips ^(A)	1965				
Average trip length (km)	10				
Speed (km/h)	50				
Damage cost NO _x (£ per tonne) ^(B)	12,172	12,416	12,664	12,918	13,176
Damage cost PM _{2.5} (£ per tonne)	109,450	111,639	113,872	116,149	118,472
Notes:					
(A) Based on the 24-hour AADT provided by Bellamy Roberts. All vehicle trips assumed to be as cars (i.e. LDVs).					
(B) An uplift of 2% per year (from the 2017 damage cost, rebased from 2021 the year of appraisal) has been applied to calculate the corresponding damage costs over a 5-year period, commencing from the assumed development opening year (2028) ¹⁹ .					

¹⁹ Defra, Air quality appraisal: damage cost guidance, updated 26 March 2021.

Table 7-2
Damage Cost Calculation – Outputs

Output Parameter	Year					Total
	2028	2029	2030	2031	2032	
Annual NO _x Emissions (tonnes/year)	0.8751	0.7885	0.7156	0.7156	0.7156	3.8102
Annual PM ₁₀ Emissions (tonnes/year)	0.2234	0.2231	0.2228	0.2228	0.2228	1.1150
Annual PM _{2.5} Emissions (tonnes/year) ^(A)	0.1419	0.1417	0.1415	0.1415	0.1415	0.7080
NO _x contribution (£) (rounded up)	10,652	9,790	9,062	9,243	9,428	48,175
PM _{2.5} contribution (£) (rounded up)	15,527	15,816	16,113	16,436	16,764	80,656
TOTAL 5-year Contribution (£) (rounded up)						128,832
Note: (A) PM _{2.5} /PM ₁₀ conversion factor of 0.635 has been applied.						

In summary, over a 5-year period a damage cost has been calculated at **£128,832**.

The above damage costs provide an indicator of the financial commitment required to off-set emissions. The amount (value) determined is not a direct indication of the monetary contribution required to off-set impacts upon air quality. Rather, the scale of damage cost will determine the level of appropriate mitigation required for specific proposals. The Interdepartmental Group on Costs and Benefits (IGCB) department of Defra, who produced the 'Damage Cost' guidance, has stated that²⁰:

"The damage costs methodology was designed for economic appraisal of government policies that lead to air quality changes and wider cost-benefit analysis. While our guidance can be used to estimate the damage to society caused per tonne of emissions, we don't provide any recommendations for the right level of compensation required to offset the impacts of air pollution."

7.2 Mitigation Statement – Proposed Mitigation

This section presents the Mitigation Statement detailing the proportionate mitigation measures required during the construction and operational phases of the Proposed Development, in line with the Sussex-air guidance.

7.2.1 Construction Phase

As discussed in Section 5.1, construction impacts associated to the Proposed Development would result in the generation of dust and PM₁₀.

The IAQM guidance outlines a number of site-specific mitigation measures based on the assessed site risk. The measures are grouped into those which are highly recommended and those which are desirable. With the effective application of the dust mitigation measures, as detailed in Table 7-3, residual effects are considered to be 'not significant'.

Table 7-3
Construction Dust Mitigation Measures

Site Application	Construction Dust Mitigation Measures
Highly Recommended	
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.

²⁰ E-mail communication between Interdepartmental Group on Costs and Benefits department of Defra, and SLR Consulting Ltd, dated 28th January 2016.

Site Application	Construction Dust Mitigation Measures
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Operating Vehicle/Machinery and Sustainable Travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.

Site Application	Construction Dust Mitigation Measures
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
	Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
	Only remove the cover in small areas during work and not all at once.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
	With respect to operating vehicle/machinery and sustainable travel:
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).

Site Application	Construction Dust Mitigation Measures
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

7.2.2 Operational Phase

As discussed, the overall effect of the Proposed Development on NO₂, PM₁₀ and PM_{2.5} concentrations at all assessed existing receptor locations is considered to be 'not significant'. In addition, effects associated with likely exposure of future occupants are initially considered to be 'not significant'. As such, and in accordance with the EPUK & IAQM guidance, long-term scheme-specific mitigation measures in relation to operational effects arising from road traffic emissions are therefore not considered to be necessary.

Notwithstanding the above, the Sussex-air guidance states the following as 'standard mitigation' for all residential developments:

- *"all gas-fired boilers to meet a minimum standard of <40mgNO_x/kWh. Consideration should be given to renewable sources of energy, e.g. air source heat pumps.*
- *meet the following relevant guidance on electric vehicle charging points and travel plans: East Sussex."*

In addition to the above, the Sussex-air guidance lists further mitigation measures that should be considered for all developments and residential developments specifically, as follows:

- *"Invest in EV charging infrastructure within the development over and above the current recommended standards;*
- *Provide vouchers for alternatives to private car use;*
- *Set up a car club within the development or contribute to the cost of a local car club;*
- *Set up or join an existing car sharing scheme for residents;*
- *Designate parking spaces for car club/car sharing vehicles;*
- *Designate parking spaces for low emission vehicles;*
- *Provide electric bikes;*
- *Improve cycle paths to link to the existing local cycle network;*
- *Provide secure cycle storage;*
- *Invest in additional evergreen infrastructure to reduce particulates and other pollutants;*
- *Contribute to local low or zero emission vehicle refuelling/recharging infrastructure;*
- *Contribute to low emission bus service provision or waste collection services;*
- *Contribute to local bike/e-bike hire schemes;*

- *Contribute to renewable fuel and energy generation projects; and*
- *Fund incentives for the take-up of low emission technologies and fuels."*

Specific mitigation measures being pursued at the Site include the following:

- extension to the 30mph Speed Limit along Bird in Eye Hill;
- bus stop and bus service improvements;
- provision of a car club scheme;
- provision of a framework travel plan; and
- improvements to pedestrian routes.

8.0 CONCLUSIONS

SLR Consulting Ltd has been commissioned by Croudace Homes Ltd, to undertake an air quality assessment to support the planning application for a proposed residential development comprising up to 290 dwellings, on land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield.

8.1 Construction Phase

A qualitative assessment of the potential dust impacts during the construction of the Proposed Development has been undertaken following IAQM guidance.

Following the construction dust assessment, the Site is found to be at worse 'Medium Risk' in relation to dust soiling effects on people and property, and 'Low Risk' in relation to human health impacts. Providing mitigation measures are implemented, such as those outlined in Section 7.2.1 of this report, residual effects from dust emissions arising during the construction phase are considered to be 'not significant'.

8.2 Operational Phase

The assessment of operational phase effects considered impacts on all relevant existing and new receptors from road traffic emissions associated with the Proposed Development.

The ADMS-Roads dispersion model (version 5.0.0.1) was used to determine the likely NO₂, PM₁₀ and PM_{2.5} concentrations at all assessed receptor locations for a series of scenarios, in accordance with technical guidance presented in LAQM.TG(16). Predicted pollutant concentration changes at existing receptor locations as a result of the Proposed Development were assessed using the EPUK & IAQM significance criteria. Whereas concentrations modelled at new receptors locations associated with the Proposed Development were compared against the relevant AQALs, to establish the suitability of the Site for residential purposes.

In accordance with EPUK & IAQM guidance, the impacts of the Proposed Development on NO₂, PM₁₀ and PM_{2.5} concentrations at all existing receptor locations are considered to be 'negligible'. Unmitigated effects associated with NO₂, PM₁₀ and PM_{2.5} concentrations at all assessed receptor locations are therefore considered 'not significant'. In addition, short-term exposure rates for all applicable pollutants are considered to be 'well-below' the relevant AQALs and are therefore considered to be not significant.

Furthermore, the predicted concentrations of NO₂, PM₁₀ and PM_{2.5} within the Site are 'well below' both the annual mean and short term AQALs, and therefore the Site is considered to be suitable for its proposed residential use. As such, effects associated with likely exposure of future occupants are considered to be 'not significant'.

Notwithstanding the above, a mitigation assessment (and associated Damage Cost Calculation) has been undertaken in line with the Sussex-air guidance. This calculated a Damage Cost of £128,832 over the 5-year period following the Site becoming operational. Suggested mitigation measures have been sourced from the Sussex-air guidance, and specific mitigation being pursued at the Site has also been detailed.

APPENDIX A – Advanced Model Input and Verification

Advanced Model Input Summary

Advanced modelling input parameters used (not previously disclosed) are summarised in Table A-1.

Table A-1
Advanced Modelling Inputs

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z0 of 0.3m was used to represent the surface roughness of the principal study area. This value relates to 'agricultural areas (max)' and is reflective of the principal study area. In addition, a roughness length z0 of 0.02m was used to represent the surface roughness of the meteorological site. This value relates to 'open grassland', reflective of the open green space setting of the Herstmonceux West End meteorological station.
Road Type	Road type within the EFT emission database	Urban (not London)
Urban Street Canyon	Inclusion of street canyons	Street Canyons have been included along sections of the B2102 New Town, B2102 Bell Lane, and B2102 High Street.

Traffic Data

Table A-2 details the traffic data used within the assessment.

Table A-2
Traffic Data Used Within the Assessment

Link	2019 BC		2028 DM		2028 DS		Speed (kph) ^(A)
	AADT	% HDV	AADT	% HDV	AADT	% HDV	
Site Access	-	-	-	-	1965	0	32.2
B2102 Bird in Eye Hill (east of Site Access)	7324	1.7	7180	1.7	7568	1.7	96.6
B2102 Bird in Eye Hill (west of Site Access)	7324	1.7	7180	1.7	8757	1.7	48.3/96.6
B2102 New Town (south of junction)	10302	1.6	11319	1.6	11441	1.6	48.3
Bridge Farm Rd	1517	1.6	1931	1.6	1931	1.6	48.3
B2102 New Town (north of junction)	17075	1.6	17302	1.6	18757	1.6	48.3
B2102 Bell Lane	11533	1.8	14738	1.8	15336	1.8	48.3/64.4
B2102 High Street	15423	1.8	19177	1.8	19638	1.8	48.3

Link	2019 BC		2028 DM		2028 DS		Speed (kph) ^(A)
	AADT	% HDV	AADT	% HDV	AADT	% HDV	
Note: (A) Speeds based upon National Speed Limits. Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).							

Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(16) as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

NO_x/NO₂ Verification

For NO_x/NO₂ model verification, 2019 WDC LAQM monitoring data has been used (Table A-3).

Table A-3
Local Monitoring Data Available for Model Verification

Site ID	X	Y	2019 Monitored NO ₂ Concentration (µg/m ³)	2019 Data Capture (%)
W4	547250	120977	33.6	91.7

It is acknowledged that the use of one monitoring location for verification purposes is not preferable, however whilst taking into consideration the extent of the traffic data and the limited monitoring undertaken within the development locale, use of one location is considered appropriate within this context.

NO_x/NO₂ verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.

As NO₂ concentrations are solely reported using diffusion tubes, NO_x was back calculated using the latest version of Defra's NO_x to NO₂ Calculator (v8.1). The NO_x to NO₂ Calculator was also used to facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO₂.

Verification was completed using the 2019 Defra background mapped concentrations (2018 base year) for the relevant 1km x 1km grid squares (i.e. those within which the model verification locations are located), as discussed in Section 4.1.3.

Comparison of the modelled vs. monitored road NO_x contribution at the relevant verification locations is provided in Table A-4. An adjustment factor of 1.435 has been derived, based on a linear regression forced through zero, as shown in Figure A-1. No further improvement to the ADMS-Roads dispersion model could be achieved.

Table A-4
NO_x/NO₂ Model Verification (1.435)

Site ID	Monitored Road NO _x (µg/m ³)	Modelled Road NO _x (µg/m ³)	Adjustment Factor
W4	46.8	32.6	1.435

Only one monitoring location has been used for verification purposes, in the absence of other suitable monitoring locations. On this basis, the derived verification factor (1.435) was subsequently applied to all modelled road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

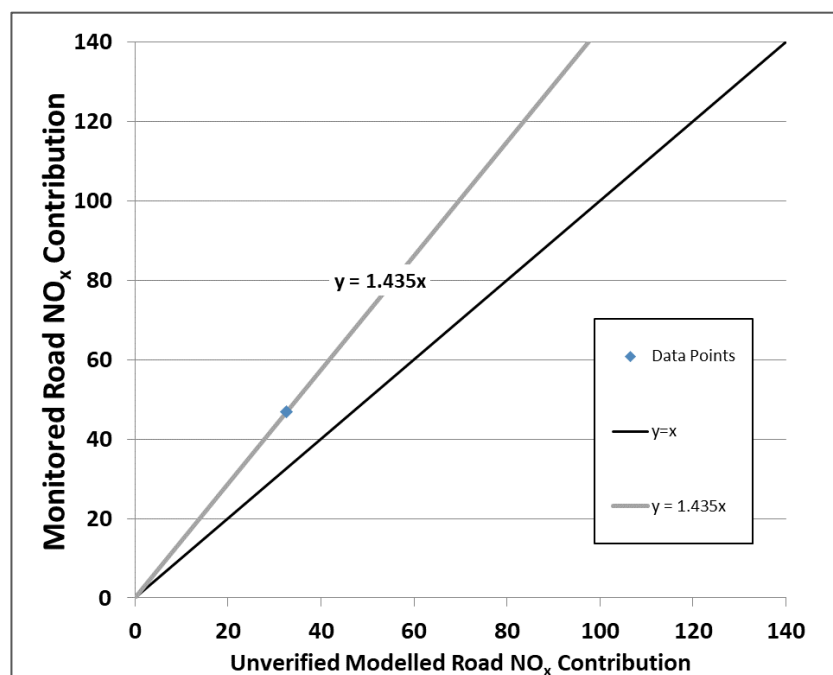


Figure A-1
Comparison of Modelled vs. Monitored Road NO_x Contribution (1.435)

PM₁₀/PM_{2.5} Verification

The adjustment factor of 1.435 was also applied to road-PM₁₀ and PM_{2.5} concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(16), in the absence of local particulate monitoring.

APPENDIX B – Sensitivity Assessment: Results

In order to provide further assessment and sensitivities on the assessment inputs, an additional scenario has been considered for the assumed opening year of 2028 (as discussed in Section 3.2.7), utilising the following inputs:

- 2019 NO_x/NO₂ background concentrations (i.e. assuming no improvement in NO_x/NO₂ background concentrations for future year); and
- 2019 NO_x vehicle emission factors (i.e. assuming no improvement in NO_x vehicle emission factors for future year).

No sensitivity analysis has been undertaken on modelled annual mean PM₁₀ and PM_{2.5} concentrations.

Nitrogen Dioxide Annual Mean: Sensitivity Results

Table B-1 below presents the modelled annual mean NO₂ concentrations at the selected receptor locations for the sensitivity assessment discussed.

Table B-1
Modelled Annual Mean NO₂ Concentrations – 2019 Sensitivity Assessment

Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		% Change of AQAL	% of 2019 DSS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 DMS	2019 DSS			
Existing Receptors					
R1	10.1	11.1	2.5	27.8	Negligible
R2	12.5	14.0	3.8	35.0	Negligible
R3	18.5	20.5	5.2	51.3	Negligible
R4	13.9	14.9	2.5	37.3	Negligible
R5	17.9	19.5	3.9	48.8	Negligible
R6	18.5	20.0	3.8	50.0	Negligible
R7	22.0	23.4	3.7	58.5	Negligible
R8	18.9	19.5	1.6	48.8	Negligible
R9	25.6	26.6	2.5	66.5	Negligible
R10	26.6	27.2	1.5	68.0	Negligible
R11	17.2	17.5	0.8	43.8	Negligible
New Receptors					
NR1	-	13.1	-	32.8	-
NR2	-	13.0	-	32.5	-
NR3	-	13.2	-	33.0	-
NR4	-	12.3	-	30.8	-

The maximum predicted annual mean NO₂ concentration at existing receptors with the development in place as part of the sensitivity assessment (2019 DSS) was at Receptor R10 with a predicted concentration of 27.2µg/m³; this represents 68.0% of the annual mean AQAL (40µg/m³). The greatest predicted increase in annual mean NO₂ concentrations due to the Proposed Development (2019 DMS vs. 2019 DSS) relative to the AQAL was 5.2% (i.e. 2.1µg/m³) – observed at Receptor R3.

In accordance with EPUK & IAQM guidance, the impact of the development on annual mean NO₂ concentrations at all the existing receptors is considered to be negligible, whilst adopting 2019-specific inputs/assumptions for the future year scenarios. This assessment has utilised a series of overly conservative assumptions which are generally accepted to improve to some degree in future years. On the balance of the above points, air quality effects associated with the operation of the Proposed Development on the existing environment are therefore still considered to be 'not significant'.

The maximum predicted annual mean NO₂ concentration at the newly introduced receptors was 13.2µg/m³, located at Receptor NR3 – representing 33.0% of the AQAL. This is considered to be 'well below' the annual mean AQAL. As such, the significance of unmitigated impacts associated with annual mean NO₂ concentrations at all new receptor locations introduced by the Proposed Development, are therefore considered to result in a 'not significant' effect. Therefore, even given the overly worst-case nature of the sensitivity assessment approach (i.e. no future improvement in background concentrations and/or vehicle emission factors), the Proposed Development is still considered suitable for the proposed residential use.

Nitrogen Dioxide 1-hour Mean: Sensitivity Results

Annual mean NO₂ concentrations predicted at all receptor locations whilst adopting 2019 inputs are well below the indicative threshold for likely exceedence of the 1-hour mean AQAL for NO₂. Therefore, even given the overly worst-case nature of the sensitivity assessment approach, it is unlikely that an exceedence of the 1-hour mean objective will occur within the Site.

Impacts associated with 1-hour mean NO₂ concentrations at all assessed receptor locations are therefore still considered to result in a 'not significant' effect.

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