



Air Quality Assessment

Land at Woodgate Nurseries, Woodgate

July 2024

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July 2024

Hanbury Properties Limited

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Chichester

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1. Introduction

Background

- 1.1 Phlorum Limited has been commissioned by Hanbury Properties Limited to undertake an Air Quality Assessment (AQA) for a proposed residential development on Land at Woodgate Nurseries, Lidsey Road, Woodgate, within the administrative boundary of Arun District Council (ADC). The National Grid Reference for the centre of the site is 493511, 104153. The site location is included in Figure 1.
- 1.2 The outline application, with all matters reserved except access, encompasses a residential development with up to 130 dwellings (Use Class C3), informal and formal public open space, landscaping, drainage, and other associated works.
- 1.3 Land use in the vicinity of the application site comprises primarily agricultural use, with the village of Woodgate located due north and Lidsey Caravan Park to the east. The remaining, ongoing operation at Lidsey Landfill Site is located to the south-west of the application site.
- 1.4 The main sources of air pollution in the vicinity of the application site are motor vehicles travelling on the local road network; namely the A29 Lidsey Road directly east of the application site. The adjacent railway line, the electrified West Coastway Line, is predominantly used by electric trains and therefore is not considered to be a significant source of combustion emissions.
- 1.5 ADC have not declared an Air Quality Management Area (AQMA) within their authoritative boundary. However, nearby Chichester District Council (CDC) have declared one 'active' AQMA, St Pancras AQMA, which is located approximately 6.9km west of the proposed development's site boundary. This AQMA was declared in 2007, due to exceedances of the annual mean Air Quality Standard (AQS) for nitrogen dioxide (NO₂).

Scope of Assessment

- 1.6 The focus of this assessment will be to assess the potential for traffic emissions generated by the proposed development to impact local air quality, as well as to determine the suitability of the site, in air quality terms, for the introduction of new, sensitive (residential) receptors.
- 1.7 The report also assesses the potential for dust nuisance and soiling impacts to occur due to the construction of the proposed development, offering recommendations for suitable mitigation to reduce the possibility of such impacts occurring.

- 1.8 An Emissions Mitigation Assessment (EMA), in line with guidance from the Sussex-Air Partnership, was also undertaken, influencing recommendations for suitable mitigation measures to further reduce potential impacts associated with development-related traffic emissions.

2. Policy Context

The UK Air Quality Strategy

- 2.1 The UK Air Quality Strategy (UKAQS)¹ sets out air quality standard (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by corresponding air quality objective (AQO) dates. The sensitive locations at which the standards and objectives apply are those where the population are reasonably expected to be exposed to said pollutants over the particular averaging period.
- 2.2 For those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to compare concentrations against the standards are areas of residential housing. It is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.
- 2.3 Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time. A summary of the AQS relevant to this assessment are included in Table 2.1, below.

Table 2.1 UK Air Quality Standards and Objectives

Pollutant	Averaging Period	Air Quality Standard ($\mu\text{g.m}^{-3}$)	Air Quality Objective
Nitrogen dioxide (NO_2)	1 hour	200	200 $\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter (PM_{10})	24-hour	50	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 35 times a year
	Annual	40	40 $\mu\text{g.m}^{-3}$
Particulate Matter ($\text{PM}_{2.5}$)	Annual	20	20 $\mu\text{g.m}^{-3}$

1 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.

- 2.4 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000², as amended, for the purpose of Local Air Quality Management. These Air Quality Regulations have been adopted into UK law from limit values required by European Union Daughter Directives on air quality.
- 2.5 The UK AQS for PM_{2.5} was amended as part of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020³.
- 2.6 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.
- 2.7 ADC has not declared any AQMAs and therefore no AQAP is in place. ADC has, however, produced an Air Quality Strategy⁴, which has been referred to where relevant when undertaking this assessment.

National Planning Policy Framework

- 2.8 The National Planning Policy Framework (NPPF)⁵, which was updated in December 2023, sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. A core principle in the NPPF that relates to air quality effects from development is that planning should "contribute to conserve and enhance the natural and local environment" as demonstrated at paragraph 180:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: [...]

e) preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability [...]"

- 2.9 With regard to assessing cumulative effects the NPPF states the following at paragraph 191:

"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 wider area to impacts that could arise from the development. [...]"

2 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

3 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020

4 Arun District Council. (2023). *Air Quality Strategy 2023*.

5 Ministry of Housing, Communities & Local Government. (2023). *National Planning Policy Framework*.

- 2.10 With regard to a compliance with relevant limit values and national objectives for air pollutants, along with assessing cumulative effects the NPPF states the following at paragraph 192:

"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 to 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."

- 2.11 With regard to promoting sustainable transport, paragraph 109 states:

"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making"

- 2.12 The NPPF offers a broad framework but does not afford a detailed methodology for assessments. Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

National Planning Practice Guidance

- 2.13 Reference ID 32 (Air Quality) of the National Planning Practice Guidance (PPG)⁶, provides guiding principles on how planning can take account of the impact of new development on air quality. The PPG summarises the importance of air quality in planning and the key legislation relating to it.
- 2.14 As well as describing the importance of International, National and Local Policies (detailed elsewhere in this report), it summarises the key sources of air quality information. It also explains when air quality is likely to be relevant to a planning decision, stating:

6 Planning Practice Guidance (PPG) 32. (2019). *Air Quality*.

"Considerations that may be relevant to determining a planning application include whether the development would:

- ❖ Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- ❖ Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- ❖ Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- ❖ Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*
- ❖ Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*

2.15 Details are also provided of what should be included within an air quality assessment. Key considerations include:

- ❖ Baseline local air quality;
- ❖ Whether the proposed development could significantly affect local air quality during its construction/operation; and
- ❖ Whether the development is likely to expose more people to poor air quality.

2.16 Examples of potential air quality mitigation measures are also provided in the PPG.

Local Planning Policy

- 2.17 The Arun Local Plan 2011-2031⁷ provides the local policy framework against which planning applications are assessed in the district. It contains policy of direct relevance to air quality and this assessment, including:

Policy QE SP1: Quality of the Environment

"The Council requires that all development contributes positively to the quality of the environment and will ensure that development does not have a significantly negative impact upon residential amenity, the natural environment or upon leisure and recreational activities enjoyed by residents and visitors to the District. [...]"

Policy QE DM3: Air Pollution

"All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

- a. Ensuring the development is located within easy reach of established public transport services;*
- b. Maximising provision for cycling and pedestrian facilities;*
- c. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points; and*
- d. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network.*

Development proposed nearby any Air Quality Management Area (AQMA) declared within the District within the Plan period, will require an air quality assessment to identify likely impacts of development upon the designated area. Developers will be required to ensure delivery of the actions set out within any Air Quality Action Plan. [...]"

Developments shall also be consistent with all other Local Plan policies."

⁷ Arun District Council. (2018). *Arun Local Plan 2011-2031*.

3. Baseline Air Quality

- *****
- 3.1 This chapter is intended to establish prevailing air quality conditions in the vicinity of the application site. The baseline air quality conditions in the vicinity of the site are established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data.
- 3.2 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website⁸. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km² National Grid square locations across the UK. At the time of writing, the most recent background maps were from August 2020 and based on monitoring data from 2018.
- 3.3 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources within the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.
- 3.4 Monitoring at roadside and background locations is considered an appropriate source of data for the purposes of describing baseline air quality. ADC's automatic and non-automatic monitoring data were reviewed to establish baseline air quality. The most recent available data at the time of writing, from ADC's *2023 Annual Status Report (ASR)*⁹, have been included. Furthermore, given the close proximity of the application site to the boundary of CDC, data from CDC's most recently published ASR¹⁰ has also been assessed where appropriate.

UK-AIR Background Pollution

- 3.5 UK-AIR predicted annual mean background pollution concentrations of NO₂, PM₁₀ and PM_{2.5} for 2019 to 2030 are presented in Table 3.1, below. These data were taken from the central grid square located within the centre of the application site (i.e. grid reference: 493500, 104500).

⁸ Defra. (2020). *UK-AIR*.

⁹ Arun District Council. (2023). *2023 Air Quality Annual Status Report*.

¹⁰ Chichester District Council. (2023). *2023 Air Quality Annual Status Report*.

Table 3.1: Predicted Background Concentrations of Pollutants at the Site

Pollutant	Predicted Annual Mean Background Concentration ($\mu\text{g}/\text{m}^3$)									
	2019	2020	2021	2022	2023	2024	2025	2026	2028	2030
NO ₂	9.3	9.0	8.7	8.4	8.2	7.9	7.7	7.5	7.3	7.1
PM ₁₀	14.2	14.0	13.8	13.6	13.5	13.3	13.1	13.1	13.2	13.3
PM _{2.5}	9.3	9.1	9.0	8.9	8.7	8.6	8.4	8.4	8.5	8.5

- 3.6 The data in Table 3.1 show that annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5}, in the vicinity of the site, between 2019 and 2030, are predicted to be well below their respective AQs.
- 3.7 The data show that in 2024 (the assessment/reporting year), NO₂, PM₁₀ and PM_{2.5} concentrations are predicted to be below their respective AQs by 80.3%, 66.8% and 57.0% respectively. As such, annual mean background pollutant concentrations are likely to be below their respective AQs at the application site.
- 3.8 Concentrations of all three pollutants are predicted to decline each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles, but also due to local, UK national and international plans to reduce emissions across all sectors.

Local Sources of Monitoring Data

- 3.9 Air quality monitoring is considered an appropriate source of data for the purposes of describing baseline air quality. At the time of writing, the most recent ASRs^{9,10} released by ADC and CDC included data from 2022.

Automatic Monitoring

NO₂

- 3.10 Whilst ADC do not undertake automatic monitoring of any pollutants, CDC currently undertake automatic (continuous) monitoring of NO₂ at two locations within 7.5km of the Application Site. The most recent available annual mean data from these monitors are included in Table 3.2, below.

Table 3.2: NO₂ Monitoring Data from CDC's Automatic Monitors

Monitor	Type	Distance from the Application Site (km)	NO ₂ Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)			
			2019	2020	2021	2022
CI5	R	6.3	27.0	19.0	23.0	23.5
CI1	S	7.5	28.0	23.0	24.0	22.4

Note: "R" = Roadside; "S" = Suburban.

- 3.11 The data in Table 3.2 show a general decrease in annual mean NO₂ concentrations at both monitors between 2019 and 2022, with particularly substantial reductions in 2020 relative to 2019; likely due to COVID-19 associated impacts on vehicular traffic and industry.
- 3.12 The closest automatic monitoring station, CI5, is within a *roadside* setting adjacent to the A285 Westhampnett Road. In 2022, this monitor recorded an annual mean NO₂ concentration of 23.5 µg.m⁻³, which is below the 40.0 µg.m⁻³ AQS by 41.3%.
- 3.13 In 2022, automatic monitor CI1 recorded an annual mean NO₂ concentration of 22.4 µg.m⁻³; below the respective AQS by 44.0%. This monitor is located adjacent to the A27 Chichester By-Pass, within close proximity of the former Stockbridge Roundabout AQMA (revoked in August 2022).

PM₁₀

- 3.14 CDC also undertook automatic (continuous) monitoring of PM₁₀ at one location within the borough; at *suburban* automatic monitoring station CI1. The most recent available annual mean data from this automatic monitoring station are included in Table 3.3, below.

Table 3.3: PM₁₀ Monitoring Data from CDC's Automatic Monitor CI1

Monitor	Type	Distance from the Application Site (km)	PM ₁₀ Annual Mean Concentration (µg.m ⁻³)			
			2019	2020	2021	2022
CI1	S	7.5	19.0	18.0	20.0	23.6

Note: "S" = Suburban.

- 3.15 The data in Table 3.3 show that annual mean concentrations of PM₁₀ at CDC's Stockbridge automatic monitoring station have, in recent years, been well below the 40.0 µg.m⁻³ AQS. In 2022, an annual mean PM₁₀ concentration of 23.6 µg.m⁻³ was recorded, 41.0% below this annual mean threshold. The data show that annual mean PM₁₀ concentrations recorded at this automatic monitoring station remained relatively stable between 2019 and 2021, with an increase observed between 2021 and 2022.

PM_{2.5}

- 3.16 CDC (and ADC) do not currently undertake automatic (continuous) monitoring of PM_{2.5} within their authoritative boundaries.

Non-Automatic Monitoring

- 3.17 ADC operate an extensive non-automatic, NO₂ diffusion tube monitoring network at strategic locations across their authoritative boundary. The most recent available annual mean monitoring data for diffusion tubes located within 3.5km of the application site are included in Table 3.4, below.

Table 3.4: Monitoring data from ADC's NO₂ Diffusion Tubes Within 3.0km of the Application Site

Monitor	Type	Distance from the Application Site (km)	NO ₂ Annual Mean Concentration (µg.m ⁻³)			
			2019	2020	2021	2022
26	R	0.0	-	14.9	15.0	18.6
25	R	2.0	-	14.8	14.8	18.0
20	R	2.2	18.5	12.9	13.9	16.0
13	R	2.9	24.1	19.9	21.1	26.5

Note: "R" = Roadside.

- 3.18 The data in Table 3.4 show that annual mean NO₂ concentrations recorded at diffusion tubes located within 3.0km of the application site did not exceed the annual mean AQS between 2019 and 2022.
- 3.19 The highest recorded concentration in 2022 was recorded at diffusion tube 13; located *roadside* to the A259 Rowan Way, distanced 2.9km to the south of the application site. In this year, a concentration of 26.5 µg.m⁻³ was recorded; 33.8% below the relevant AQS.
- 3.20 Diffusion Tube 26, located approximately 50m from the application site's red line boundary, is the closest diffusion tube to the application site. The tube is positioned within a *roadside* setting, adjacent to the A29 Lidsey Road. In 2022, an annual mean NO₂ concentration of 18.6 µg.m⁻³ was recorded; 53.5% below the annual mean AQS.

4. Assessment Methodology

Guidance

- 4.1 Defra's *Local Air Quality Management Technical Guidance* (LAQM.TG(22))¹¹ was followed in carrying out the assessment.
- 4.2 The latest Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) guidance on '*Planning for Air Quality*'¹² was also referred to throughout the assessment. The criteria used to describe impacts were derived from this guidance, and have been included in Appendix A.
- 4.3 Guidance published by the IAQM on the '*Assessment of Dust from Demolition and Construction*'¹³ was also used to assess the risk of dust emissions during the construction phase of the proposed development. The Greater London Authority's (GLA) *Supplementary Planning Guidance*¹⁴ on the control of dust from construction has also been referred to, which is considered best practice guidance for London and the wider UK. It details a number of mitigation measures that should be adopted to minimise adverse impacts from dusts and fine particles.
- 4.4 The Design Manual for Roads and Bridges (DMRB): LA105 Air Quality¹⁵ has additionally been consulted within this assessment.
- 4.5 ADC is a member of the Sussex-Air partnership, and so the *Air Quality and Emissions Mitigation Guidance for Sussex (2021)*¹⁶ (AQEMGFS) has been followed in the emissions mitigation assessment.

Construction Phase

- 4.6 The construction phase of the proposed development will involve a number of activities that could potentially produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles.

11 Defra. (2022). *Local Air Quality Management Technical Guidance* (LAQM.TG(22)).

12 EPUK & IAQM. (2017). *Land-Use Planning & Development Control: Planning For Air Quality*.

13 IAQM. (2024). *Guidance on the Assessment of Dust from Demolition and Construction*.

14 Greater London Authority. (2014). *The Control of Dust and Emissions During Construction and Demolition*.

15 National Highways. (2019). *LA105: Air Quality*.

16 Sussex-Air (2021). *Air Quality and Emissions Mitigation Guidance for Sussex (2021)*.

- 4.7 The IAQM's guidance to assess the impacts of construction dust emissions on human and ecological receptors has been followed in carrying out this air quality assessment. The guidance suggests that where a receptor is located within 250m (50m for statutory ecological receptors) of a site boundary and/or 50m of a route used by construction vehicles, up to 250m from the site entrance, a dust assessment should be undertaken. High sensitivity receptors are considered particularly sensitive when located within 20m of a works area. Figure 2 shows receptors that could be sensitive to dust that are located within 250m of the site boundary.
- 4.8 The Multi Agency Geographic Information for the Countryside (MAGIC) website¹⁷, which incorporates Natural England's interactive maps, has been reviewed to identify whether any statutory ecological sensitive receptors are situated within 50m of the site boundary or within 50m of any routes used by construction vehicles on the public highway, up to 250m from the site entrance.

Construction Significance

- 4.9 The IAQM guidance suggests that Demolition, Earthworks, Construction and Trackout should all be assessed individually to determine the overall significance of the construction phase.
- 4.10 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages. Whilst the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables mean that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a "technically competent assessor". The construction phase assessment therefore relies on the experience of the appraiser.
- 4.11 As such, attempts to define precisely what constitutes a negligible, small, medium or large dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and time, the construction materials and the plant to be used must be considered.
- 4.12 The second step is to define the sensitivity of the area around the construction site. As stated in the IAQM guidance:

"the sensitivity of the area takes into account a number of factors:

- ☞ the specific sensitivities of receptors in the area;*
- ☞ the proximity and number of those receptors;*
- ☞ in the case of PM₁₀, the local background concentrations; and*

17 Natural England and MAGIC partnership organisations. *Multi Agency Geographic Information for the Countryside*. [Accessed May 2024].

- ☛ *site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.”*

- 4.13 Based on these factors, the area is categorised as being of ‘Low’, ‘Medium’ or ‘High’ sensitivity.
- 4.14 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the stages assessed. Again, this is subject to professional judgement.
- 4.15 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the site will also be released. However, the volumes and periods over which these releases will occur are unlikely to result in any long-term impacts on local air quality and therefore this has been scoped out of the assessment.

Operational Phase

Pollutant Sources

- 4.16 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to atmosphere via tailpipe exhausts. The most significant pollutants released by cars and other vehicles are oxides of nitrogen (NO₂/NO_x) and particulate matter (PM₁₀ and PM_{2.5}). Releases of carbon monoxide (CO) and some volatile hydrocarbons (e.g. benzene and 1,3-butadiene) are of less significance and are not assessed further in this report.
- 4.17 The closest proposed sensitive receptor will be located approximately 560m Lidsey Landfill's Compound Area. Although the landfill is capped and filled, methane gas is extracted and combusted through three stationary generators and/or a standby gas flare. However, there is no active operational waste use at the Landfill currently and, therefore, impacts emissions associated with HDV movements and wider odour impacts from the Landfill's processing operations are not expected¹⁸.
- 4.18 Furthermore, Phlorum assessed the impact of emissions from the Landfill generators within a previous AQA¹⁹ for a consented Hanbury development at Woodgate Nurseries. The modelled contours within this previous assessment show that both the annual mean and short term AQS' for NO₂ are not anticipated to be exceeded at any location within the site boundary and, therefore, the impact of the landfill generators at the proposed development have not been considered further within this report.

18 Tetra Tech. (2024). *Waste Infrastructure Statement*.

19 Phlorum. (2023). *Air Quality Assessment*.

- 4.19 As it is elevated concentrations of NO₂ and PM₁₀ that have resulted in the declaration of most AQMAs across the UK, these are the pollutants of most concern and they have therefore been the focus of this air quality assessment. PM_{2.5}, which is another fraction of particulate matter, has also been considered.
- 4.20 Other (background) air pollutant sources contribute to local pollution. These include emissions from; domestic, commercial, industrial, marine, or transboundary emissions/sources. These emissions are accounted for in this assessment within the background estimates.
- 4.21 The NO₂ background concentrations referred to in this assessment are based on the monitored results recorded at CDC's diffusion tube DT7 which, in 2022, recorded an annual mean NO₂ concentration of 10.5 µg.m⁻³. DT7 was used within the assessment's model verification and subsequently within the wider modelling scenarios for conservative purposes, noting that the background concentrations recorded at this diffusion tube were in exceedance of the UK-AIR values for NO₂ at the application site.
- 4.22 Noting that there is no active monitoring of PM₁₀ and PM_{2.5} within ADC's authoritative boundary, UK-AIR 2022 predictions for Particulate Matter (PM₁₀ and PM_{2.5}) were obtained from each individual UK-AIR grid square in which each modelled receptor was positioned. A summary of the background pollutant concentrations used in this assessment are provided in Table 4.1, below

Table 4.1: Background Particulate Matter Concentrations used in this Assessment

UK-AIR Grid Square		Pollutant	Annual Mean Concentration for 2022 (µg.m ⁻³)
X	Y		
493500	102500	PM ₁₀	13.9
		PM _{2.5}	8.7
493500	101500	PM ₁₀	14.5
		PM _{2.5}	9.5
493500	104500	PM ₁₀	13.6
		PM _{2.5}	8.9
493500	105500	PM ₁₀	13.8
		PM _{2.5}	8.8
494500	150500	PM ₁₀	13.3
		PM _{2.5}	8.8

Roads Assessment

- 4.23 The latest EPUK & IAQM planning guidance¹² provides indicative thresholds for changes in traffic flows which would require a detailed air quality assessment. Outside of an AQMA these are a change in 24-hour annual average daily traffic (AADT) flows of >500 light duty vehicles (LDVs) and/or >100 heavy duty vehicles (HDVs) on any specific road link. Changes below these thresholds can be reasonably considered to have an insignificant impact on air quality.
- 4.24 Traffic data provided by Highgate Transportation, the project transport consultants, stipulates that the proposed development is anticipated to generate an AADT flow of 590 (all LDVs) once operational. In combination with the adjacent, consented Hanbury developments, a combined/cumulative traffic flow of 1735 AADT (all LDVs) is anticipated. The traffic generation thresholds prescribed within the EPUK & IAQM guidance were exceeded on the following road links:
- ❖ A29 Lidsey Road;
 - ❖ A29 Westergate Road;
 - ❖ A29 Nyton Road; and
 - ❖ A29 Shripney Road.
- 4.25 Therefore, detailed pollutant dispersion modelling has been undertaken to ascertain the likely impacts of associated traffic emissions on local air quality at sensitive receptors, adjacent to these road links. Further details on the traffic flows used within this modelling assessment are provided in Appendix B.
- 4.26 To ensure a conservative approach, traffic flows from nearby committed developments have additionally been included within the modelling assessment. These developments include:
- ❖ Wings Nursery (Ref: AL/20/21/PL);
 - ❖ Lee's Yard (Ref: AL/21/20/OUT);
 - ❖ Woodgate Centre, Oak Tree Lane (Ref: AL/107/21/PL)
 - ❖ Land to the rear of Meadow Way (Ref: AL/178/22/OUT);
 - ❖ Land South of Barnham Station, Barnham (Ref: BN/147/22/RES); and
 - ❖ Land East of Shripney Road (Ref: BE/61/23/RES).

Model Specification

- 4.27 The model used was ADMS-Roads (version 5.0.1.3), which is produced by Cambridge Environmental Research Consultants (CERC) Limited and has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads. The latest Defra Emissions Factor Toolkit (EFT)²⁰ was used within the model to estimate vehicle emissions. Details on model inputs are provided in Appendix B.

20 Defra. (2023). *Emissions Factor Toolkit version 12.0.1*.

Meteorological Data

- 4.28 Detailed, hourly sequential, meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements. Meteorological data used in the model were obtained from Thorney Island, as it was considered to provide the most representative data of similar conditions to the site. The meteorological data used for this assessment were from 2022, for which air quality monitoring and traffic data were also available. The surface roughness applied to the model for the application site/study area was 0.4m, whilst a factor of 0.05m was applied to the meteorological site; representative of short grassland.

Model Verification

- 4.29 It is recommended, following guidance set out in LAQM.TG(22)¹¹ that the model results be compared with measured data to determine whether they need adjusting to reflect local air quality more accurately. This process is known as verification and reduces the uncertainty associated with local effects on pollution dispersion and allows the model results to be more site-specific.
- 4.30 A verification study has been undertaken using local authority monitoring data from 2022 across the nearby area; namely surrounding Chichester. Full details of this study are included in Appendix C. The model was found to be under-predicting concentrations to a degree, which is not unusual and is likely the result of the local dispersion environment; an adjustment factor of **2.15** was, therefore, applied to the model results.
- 4.31 Root Mean Square Error (RMSE) is used to define the average error or uncertainty of the model. According to LAQM.TG(22), the RMSE is acceptable where it is within 25% of the AQS. The model verification process calculated a post-adjusted RMSE of $2.2 \mu\text{g.m}^{-3}$, which equates to 5.5% of the annual mean AQS for NO₂ and is therefore considered to be suitable.

Modelled Sensitive Receptors

- 4.32 Model receptors were positioned at the façade of existing residential units adjacent to the aforementioned road links, identified as being most at risk from high roadside pollutant levels. Receptors are, therefore, positioned at worst-case locations, for a conservative approach. The receptors were modelled at “breathing height” which is, by convention, 1.5m above ground.
- 4.33 Details of sensitive receptors are displayed in Figure 3 and are included in Table 4.2, below.

Table 4.2: Modelled Receptors

Receptor		Height (m)	UK Grid Reference	
ID	Details		X	Y
R1	A29 Shripney Road	1.5	493761.3	102496.2
R2	A29 Shripney Road	1.5	493844.44	101967.84
R3	A29 Shripney Road	1.5	493879.14	101923.88
R4	A29 Lidsey Road	1.5	493812.05	104165.02
R5	A29 Lidsey Road	1.5	493804.12	104301.52
R6	A29 Westergate Road	1.5	493784.62	104511.56
R7	A29 Westergate Road	1.5	493852.20	104726.38
R8	A29 Westergate Road	1.5	493862.90	104809.84
R9	A29 Westergate Road	1.5	493842.79	105005.16
R10	A29 Westergate Road	1.5	493857.13	105053.57
R11	A29 Westergate Road	1.5	493831.14	105177.85
R12	A29 Westergate Road	1.5	493862.95	105308.81
R13	B2233 Nyton Road	1.5	493891.69	105585.00
R14	A29 Nyton Road	1.5	494009.30	105568.20
R15	A29 Nyton Road	1.5	494185.00	105570.20
R16	A29 Nyton Road	1.5	494336.40	105591.10

Model Uncertainty

4.34 There are a number of inherent uncertainties associated with the modelling process, including:

- ☞ Model uncertainty – due to model formulations;
- ☞ Data uncertainty – due to inaccuracies in input data, including emissions estimates, background estimates and meteorology; and
- ☞ Variability – randomness of measurements used.

- 4.35 Using a validated air quality model such as ADMS-Roads combined with performing model verification accounts for much of this uncertainty. In addition, the most detailed available input data have been used and reviewed to ensure accuracy.
- 4.36 Defra's latest Emissions Factors Toolkit²⁰ for road transport provides forecasts of NO_x, PM₁₀ and PM_{2.5} emissions up to 2030. This is widely used as an input for dispersion models such as ADMS-Roads to estimate future pollutant concentrations close to new developments.
- 4.37 The latest version of Defra's EFT (version 12.0.1) was released in December 2023 and is expected to provide a far more reasonable match for real world emissions in the current UK fleet than previous versions.
- 4.38 Background pollutant concentrations were predicted to stay the same beyond 2022, despite the decreasing trends in background pollutant concentrations as evidenced in Table 3.1. This provides a conservative approach by assuming that there will be no future improvement in background pollutant concentrations beyond 2022. Furthermore, vehicle emission factors for 2022 were used in each future year modelled scenario to predict pollutant concentrations in the developments projected opening year of 2028.

Emission Mitigation Assessment

- 4.39 The Sussex-air Partnership's *Air Quality and Emissions Mitigation Guidance for Sussex*¹⁶ (2021) (AQEMGFS) advocates that an Emissions Mitigation Assessment should be undertaken to demonstrate how air quality impacts from development can be minimised.
- 4.40 The purpose of an Emissions Mitigation Assessment is to determine an appropriate level of mitigation required from a development. An Emissions Mitigation Assessment sets out a methodology to assess the impact of a development's associated emissions on air quality and provides an approach to mitigating emissions for developments, even those which have no significant impact on air quality.
- 4.41 As the proposed development is classified as *Major* with reference to the AQEMGFS¹⁶, an Emissions Mitigation Assessment with an emissions cost calculation is required. The emissions cost calculation was undertaken following the AQEMGFS and Defra's Damage Cost guidance²¹. The latest Defra air quality Damage Cost Appraisal Toolkit²² was also utilised within the assessment.

Emissions Cost Calculation

- 4.42 The emissions calculation utilised the latest Defra Emission Factor Toolkit (EFT) (version 12.0.1)²⁰ to determine the total transport related emissions (NO_x and PM_{2.5}) that would be generated by the proposed development.

²¹ Defra. (2023). *Damage Cost*.

²² Defra. (2023). *Air Quality Damage Cost Appraisal Toolkit*.

- 4.43 Defra provides 'damage costs'²¹, which are a set of impact values, defined per tonne of pollutant for use in this calculation. Damage costs estimate the societal costs associated with changes in pollutant emissions and are then combined with the forecasted emissions changes to provide an approximate valuation of the cost (or benefit) to society caused by development.
- 4.44 Defra's Appraisal Toolkit²², which incorporates the latest damage cost values, was used in the calculation. The principal of the calculation is summarised in the equation below:

$$EFT\ output \times Damage\ costs \times 5\ years = 5\ year\ exposure\ cost\ value\ (in\ £)$$

- 4.45 As a number of the inputs are based on assumptions, the resulting figure should be treated with caution, but it can be used to give an idea of the scale of a development in terms of total generated transport emissions and therefore a gauge of what level of mitigation might be appropriate.
- 4.46 It is usual for costs established in this way to be apportioned to low emission measures associated with a proposed development. In doing this it should be possible for damage costs to be offset.

5. Construction Phase

- 5.1 The construction phase of the proposed development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust.
- 5.2 The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are based on the professional experience of Phlorum's consultants, and data provided by GIS mapping and Google Earth imagery.

Dust Emission Magnitude

Demolition

- 5.3 The total volume of the buildings, namely the existing horticultural nurseries, proposed for demolition is anticipated to be between 12,000m³ – 75,000m³, with a maximum demolition height of between 6 and 12m. Therefore, with reference to IAQM's respective guidance¹³, the overall dust emission magnitude for the demolition phase is considered to be *Medium*.

Earthworks

- 5.4 The total area of the site within the red line boundary is approximately 80,000m², which falls into the IAQM's *Medium* dust emission category.
- 5.5 Noting the size of the site, it is anticipated that more than 10 earth-moving vehicles will be operating on-site actively at any one time, falling into the IAQMs *Large* category. As such, the overall dust emission magnitude for the earthworks phase is considered to be *Large* with reference to IAQM guidance¹³.

Construction

- 5.6 During construction, activities that have the potential to cause emissions of dust may include concrete batching and sandblasting. Localised use of cement powder and general handling of construction materials also have the potential to generate dust emissions, as does the effect of wind-blow from stockpiles of friable materials.
- 5.7 Given the scale of the proposed development, is anticipated that the total construction volume of the development will be in exceedance of 75,000m³, falling into the IAQMs *Large* category.
- 5.8 As such, the overall dust emission magnitude during construction is considered to be *Large*.

Trackout

- 5.9 Construction traffic, when travelling over soiled road surfaces, has the potential to generate dust emissions and to also add soil to the local road network. During dry weather, soiled roads can lead to dust being emitted due to physical and turbulent effects of vehicles.
- 5.10 As well as the type of road surface, the number of daily HDVs accessing the site can be used to determine dust emission magnitude: <20 *Small*; 20-50 *Medium*; and >50 *Large*. For conservative purposes, it is anticipated between 20 and 50 HDVs will access the site daily.
- 5.11 It is expected that unpaved roads will be utilised throughout the duration of the construction project. For conservative purposes, it is estimated that the length of the unpaved surfaces may exceed 100m. Therefore, the overall dust emission magnitude for the trackout phase is considered to be *Large*.

Emission Magnitude Summary

- 5.12 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout as specified in the IAQM guidance, and discussed above, are listed in Table 5.1 below. Overall, the dust emission magnitude is considered to be *Large*.

Table 5.1: Dust Emission Magnitude for the Construction Activities, Based on the IAQM's Guidance.

Activity	Dust Emission Magnitude
Construction	Medium
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

- 5.13 Having established the emission magnitudes for each phase above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor.
- 5.14 High sensitivity human receptors include residential dwellings, schools and hospitals, but can also include locations such as car showrooms when considering the impacts of dust soiling. Medium sensitivity receptors include locations where individuals would be expected to enjoy a reasonable level of amenity, but not the same level as would be expected in their homes, such as workplaces and parks.

- 5.15 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.
- 5.16 With the exponential decline in dust levels with distance from dust generating activities, it is considered that for receptors more than 250m from the site boundary, the risk is negligible. Furthermore, the risks at over 100m only have the potential to be significant in certain weather conditions, e.g. downwind of the source during dry periods.
- 5.17 The approximate number of high sensitivity human receptors in the vicinity of the site is detailed in Table 5.2 below.

Table 5.2: Approximate Number of High Sensitivity Receptors Close to the Site.

Distance to Site (m)	Approximate Number of Receptors	Receptor Details
<20	30	Residential Dwellings on Lidsey Road and the adjacent Thakeham Homes Scheme
<50	80	Residential Dwellings on Lidsey Road, the adjacent Thakeham Homes Scheme, Cohen Close and Aldingbourne Residential Park
<100	>175	Residential Dwellings on Neighbouring Roads
<250	>500	Residential Dwellings on Neighbouring Roads

- 5.18 Figure 4 shows that the predominant wind direction at the closest relevant meteorological station at Thorney Island (2019) is from the south-west, with lesser winds also from the west and north-east. There are approximately 30 highly sensitive receptors within 20m of the site boundary, namely residential dwellings, some of which are downwind of the site in the prevailing south-westerly wind. Therefore, following IAQM guidance¹³, the sensitivity of the area to dust soiling impacts is defined as *High*.
- 5.19 The UK-AIR data presented in Table 3.1 indicate that annual mean concentrations of PM₁₀ are likely to be well below 24.0 µg.m⁻³ within the vicinity of the site²³. Noting the number of highly sensitive receptors within 20m of the site boundary, the sensitivity of the area to human health impacts is defined as *Low* with reference to IAQM guidance¹³.

23 The 24.0µg.m⁻³ 'threshold' is taken from Table 3 of the IAQM's construction dust guidance. This threshold, along with the number of receptors, their sensitivity, and their distance from source (construction site), helps establish the sensitivity of an area in terms of potential human health impacts from exposure to PM₁₀. According to the guidance, baseline annual mean PM₁₀ concentrations below 24.0µg.m⁻³ indicate that the sensitivity of the area in terms of human

- 5.20 The Multi Agency Geographic Information for the Countryside (MAGIC) website¹⁷ has been reviewed to identify whether any statutory ecological sensitive receptors are situated within 50m of the site boundary or within 50m of any routes used by construction vehicles on the public highway, up to 250m from the site entrance. The closest statutory site, Bersted Brooks Local Nature Reserve (LNR), is located approximately 2.0km to the south of the site boundary. Therefore, based on distance alone, dust impacts to ecological receptors can be screened out.

Risk of Impacts

- 5.21 Having established the potential dust emission magnitudes and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM guidance. These are summarised in Table 5.3, below.

Table 5.3: Summary of Impact Risk by Construction Stage Based on the IAQM's Dust Guidance.

Stage	Impact Risk		
	Nuisance Dust	Ecology	PM ₁₀ Health Effects
Demolition	Medium Risk	Negligible Risk	Low Risk
Earthworks	High Risk	Negligible Risk	Low Risk
Construction	High Risk	Negligible Risk	Low Risk
Trackout	High Risk	Negligible Risk	Low Risk

- 5.22 Overall, the proposed development is considered to be *High Risk* for nuisance dust soiling effects, *Low Risk* for PM₁₀ health effects, and *Negligible Risk* for ecological impacts, in the absence of mitigation.

Site Specific Mitigation

- 5.23 The GLA guidance¹⁴ suggests a number of mitigation measures that should be adopted in order to minimise impacts from dusts and fine particles. Appropriate measures that could be included during construction of the proposed development include:
- ☉ ideally cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible;
 - ☉ where such work must take place, water suppression should be used to reduce the amount of dust generated;

health impacts is *Low* in all cases except when there are a large number (>100) of highly sensitive receptors within 20m of the construction site.

- ☛ skips, chutes and conveyors should be completely covered and, if necessary, enclosed to ensure that dust does not escape;
- ☛ no burning of any materials should be permitted on site;
- ☛ any excess material should be reused or recycled on-site in accordance with appropriate legislation;
- ☛ developers should produce a waste or recycling plan;
- ☛ following earthworks, exposed areas and soil stockpiles should be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
- ☛ stockpiles should be stored in enclosed or bunded containers or silos and kept damp where necessary;
- ☛ hard surfaces should be used for haul routes where possible;
- ☛ haul routes should be swept/washed regularly;
- ☛ vehicle wheels should be washed on leaving the site;
- ☛ all vehicles carrying dusty materials should be securely covered; and
- ☛ delivery areas, stockpiles and particularly dusty items of construction plant should be kept as far away from neighbouring properties as possible.

5.24 In addition, the IAQM lists recommended mitigation measures for *Low*, *Medium* and *High* Dust Impact Risks. The highly recommended mitigation measures for *High Risk* sites are included in Appendix D of this report.

5.25 Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures should be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of activities that are likely to generate a particularly significant amount of dust.

Residual Effects

5.26 After the implementation of the mitigation measures listed above and in Appendix D, the significance of each phase of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*.

6. Operational Phase

Air Quality Impacts at Local Receptors

- 6.1 Traffic data provided by the transport consultants for the project, Highgate Transportation, show that the proposed development, in combination with the two consented Hanbury developments at Woodgate Nurseries, is expected to generate a total AADT of 1,735 (all LDVs). The proposed traffic generation is expected to be in exceedance of the indicative EPUK & IAQM threshold (for LDVs) on the following road links:
- ❖ A29 Lidsey Road;
 - ❖ A29 Westergate Road;
 - ❖ A29 Nyton Road; and
 - ❖ A29 Shripney Road.
- 6.2 Therefore, the impact of scheme generated traffic emissions at local sensitive receptor locations has been assessed across the above listed road links.
- 6.3 Receptors R1-R16 represent the external façades of existing local sensitive receptors; namely residential dwellings directly adjacent to the aforementioned road links. Further details can be found in Table 4.2.
- 6.4 Three assessment scenarios have been modelled, as follows:
- ❖ 2022 Baseline;
 - ❖ 2028 Without + Committed Developments; and
 - ❖ 2028 With + Committed Developments.
- 6.5 Table 6.1 below presents modelled annual mean NO₂ concentrations in a worst-case 'Emission Factor Year' scenario, which assumes no improvement in vehicle fleet emissions beyond the baseline year of 2022; fleet emissions would be expected to actually reduce with time as older cars are 'retired' and replaced with newer, cleaner, vehicles.

Nitrogen dioxide (NO₂)

- 6.6 Modelled NO₂ concentrations at local existing sensitive receptor locations are shown in Table 6.1, below.

Table 6.1: Predicted Annual Mean Concentrations of NO₂ at Local Receptors

Receptor	Annual Mean NO ₂ (µg.m ⁻³)			Changes Due to Proposed Development		
	2022 Baseline	2028 Without + Committed Development	2028 With + Committed Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Impact Descriptor
R1	17.2	17.8	18.2	0.4	1.0	Negligible
R2	15.7	16.2	16.5	0.3	0.8	Negligible
R3	14.8	15.1	15.4	0.3	0.7	Negligible
R4	15.8	16.4	16.7	0.3	0.8	Negligible
R5	19.7	21.0	21.5	0.5	1.2	Negligible
R6	17.2	18.1	18.5	0.3	0.9	Negligible
R7	19.2	20.5	20.9	0.5	1.2	Negligible
R8	18.6	19.7	20.1	0.4	1.1	Negligible
R9	17.6	18.6	19.0	0.4	1.0	Negligible
R10	21.3	22.9	23.5	0.6	1.5	Negligible
R11	19.9	21.2	21.7	0.5	1.3	Negligible
R12	19.6	20.9	21.3	0.5	1.2	Negligible
R13	15.9	16.6	16.8	0.2	0.5	Negligible
R14	29.8	31.7	32.3	0.6	1.6	Slight
R15	26.4	27.9	28.4	0.6	1.4	Negligible
R16	34.1	36.4	37.2	0.8	2.0	Slight

Note: Any discrepancies due to rounding.

- 6.7 The data in Table 6.1 show that no receptors are predicted to be in exceedance of the annual mean AQS for NO₂ within each modelled scenario.
- 6.8 The highest modelled concentration was at R16, adjacent to the A29 Nyton Road. This receptor is predicted to have a modelled annual mean concentration of 37.2 µg.m⁻³ in the 2028 With + Committed Development scenario, when taking into consideration the impacts of traffic flows from both the proposed development and other committed developments (as previously discussed). This modelled concentration is below the respective AQS by 7.0%.
- 6.9 The largest increase in annual mean NO₂ concentrations predicted under the 2028 With + Committed Development scenario was 0.8 µg.m⁻³, again at receptor R16; equating to a 2.0% change relative to the AQS. Increases predicted at this receptor were considered to have a *Slightly Adverse* impact, with reference to the EPUK & IAQM impact descriptors¹².

- 6.10 An increase in annual mean NO₂ concentrations of 0.6 µg.m⁻³ was predicted at receptor R14, located adjacent to the A29 Nyton Road. Within the modelled 2028 With + Committed Development scenario, a concentration of 32.3 µg.m⁻³ was predicted at this receptor; 19.3% below the long-term AQS. Changes in NO₂ concentrations at this receptor equate to be an increase of 1.6%, with respect to the 40 µg.m⁻³ annual mean AQS. Therefore, the increase at this receptor was considered to have a *Slightly Adverse* impact.
- 6.11 Otherwise, imperceptible increases in annual mean NO₂ concentrations were predicted at all other modelled receptors points. Changes at these receptors can be described as *Negligible*, with reference to the EPUK & IAQM guidance¹².
- 6.12 LAQM.TG(22)¹¹ states that where annual mean NO₂ concentrations are below 60.0 µg.m⁻³, the short-term AQS for NO₂ (200.0 µg.m⁻³ not to be exceeded more than 18 times per year) is not likely to be exceeded. As the annual mean NO₂ concentrations predicted at all receptor locations were well below 60.0 µg.m⁻³, following LAQM.TG(22) guidance, it is expected that the hourly AQS for NO₂ would be achieved.

Particulate Matter (PM₁₀ and PM_{2.5})

- 6.13 Modelled results for annual mean PM₁₀ concentrations at local receptor locations are shown in Table 6.2, below.

Table 6.2: Predicted Annual Mean Concentrations of PM₁₀ at Local Receptors

Receptor	Annual Mean PM ₁₀ (µg.m ⁻³)			Changes Due to Proposed Development		
	2022 Baseline	2028 Without + Committed Development	2028 With + Committed Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Impact Descriptor
R1	15.4	15.6	15.7	0.1	0.3	Negligible
R2	15.8	15.9	16.0	0.1	0.2	Negligible
R3	15.6	15.7	15.7	0.1	0.2	Negligible
R4	15.0	15.1	15.2	0.1	0.2	Negligible
R5	16.0	16.3	16.4	0.1	0.3	Negligible
R6	15.4	15.6	15.7	0.1	0.3	Negligible
R7	15.9	16.3	16.4	0.1	0.3	Negligible
R8	15.8	16.1	16.2	0.1	0.3	Negligible
R9	15.7	16.0	16.1	0.1	0.3	Negligible
R10	16.7	17.2	17.4	0.2	0.4	Negligible
R11	16.3	16.7	16.8	0.1	0.4	Negligible
R12	16.2	16.6	16.7	0.1	0.3	Negligible
R13	15.1	15.3	15.4	0.1	0.1	Negligible
R14	18.7	19.2	19.4	0.2	0.5	Negligible
R15	17.7	18.2	18.3	0.2	0.4	Negligible
R16	19.7	20.3	20.6	0.3	0.6	Negligible

Note: Any discrepancies due to rounding.

- 6.14 The data in Table 6.2 show that the operation of the proposed development was predicted to have an imperceptible impact on PM₁₀ concentrations at all modelled sensitive receptors.
- 6.15 The highest predicted PM₁₀ concentration in the 2028 With + Committed Development scenario was 20.6 µg.m⁻³ at receptor R16. This concentration is below the 40.0 µg.m⁻³ AQS by 48.5%.
- 6.16 The largest change in PM₁₀ concentrations due to the operation of the proposed development was 0.3 µg.m⁻³, also expected at receptor R16 (0.6% of the AQS).
- 6.17 For PM₁₀ the following equation can be used to derive the number of days that the daily mean limit of 50.0 µg.m⁻³ AQS is likely to be exceeded:
- $$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$
- 6.18 Using this equation, an annual mean PM₁₀ concentration of approximately 32 µg.m⁻³ may indicate an exceedance of the short-term (daily mean) AQS for PM₁₀. The data in Table 6.2 show that annual mean PM₁₀ concentrations are expected to be no higher than 20.6 µg.m⁻³ at all receptor points. Therefore, it is unlikely that this short-term AQS would be exceeded.
- 6.19 Overall, the operation of the proposed development is expected to have a *Negligible* impact on local PM₁₀ concentrations.
- 6.20 Results for annual mean PM_{2.5} concentrations predicted at local receptors are shown in Table 6.3, below.

Table 6.3: Predicted Annual Mean Concentrations of PM_{2.5} at Local Receptors

Receptor	Annual Mean PM _{2.5} (µg.m ⁻³)			Changes Due to Proposed Development		
	2022 Baseline	2028 Without + Committed Development	2028 With + Committed Development	µg.m ⁻³	As a % of the AQS	EPUK & IAQM Impact Descriptor
R1	9.6	9.7	9.7	0.1	0.2	Negligible
R2	10.2	10.2	10.3	0.0	0.2	Negligible
R3	10.0	10.1	10.1	0.0	0.2	Negligible
R4	9.6	9.7	9.7	0.0	0.2	Negligible
R5	10.1	10.3	10.4	0.1	0.3	Negligible
R6	9.8	9.9	10.0	0.1	0.2	Negligible
R7	10.1	10.3	10.3	0.1	0.3	Negligible
R8	10.0	10.2	10.2	0.1	0.3	Negligible
R9	9.8	10.0	10.1	0.1	0.2	Negligible
R10	10.4	10.6	10.7	0.1	0.4	Negligible
R11	10.2	10.4	10.5	0.1	0.3	Negligible
R12	10.1	10.3	10.4	0.1	0.3	Negligible
R13	9.5	9.6	9.7	0.0	0.1	Negligible

R14	11.7	12.0	12.1	0.1	0.4	Negligible
R15	11.2	11.4	11.5	0.1	0.4	Negligible
R16	12.2	12.6	12.7	0.1	0.5	Negligible

Note: Any discrepancies due to rounding.

- 6.21 The data in Table 6.3 show that the operation of the proposed development is, again, expected to have an imperceptible impact on PM_{2.5} concentrations at local sensitive receptors.
- 6.22 Annual mean PM_{2.5} concentrations were predicted to be below the 20.0 µg.m⁻³ AQS at all modelled receptor points, across all modelled scenarios.
- 6.23 The highest predicted PM_{2.5} concentration under the 2028 With + Committed Development scenario was 12.7 µg.m⁻³ at receptor R16; below the respective AQS by 36.5%.
- 6.24 Overall, the operation of the proposed development is expected to have a *Negligible* impact on local PM_{2.5} concentrations.

Site Suitability

- 6.25 When assessing the suitability of the site for the proposed end use, annual mean pollutant concentrations of NO₂, PM₁₀, and PM_{2.5} are considered to be the most relevant in terms of the potential exposure of future residents; with reference to Box 1-1 in Defra's Technical Guidance¹¹. Annual mean AQSs largely apply when assessing the potential impact of air quality in locations where members of the public might be regularly exposed, such as a residential dwelling.
- 6.26 Annual mean thresholds of 40.0 µg.m⁻³ (NO₂), 40.0 µg.m⁻³ (PM₁₀), and 20.0 µg.m⁻³ (PM_{2.5}) are therefore considered to be an appropriate benchmark for this site suitability assessment.
- 6.27 Proposed residential dwellings at the application site were not modelled due to the extensive distance between the proposed dwellings and nearby significant emission sources, namely the A29 Lidsey Road. At its closest point, the closest proposed residential receptor is distanced approximately 50m from the aforementioned road link.
- 6.28 Noting the extensive distance between the application site's closest sensitive receptor and the A29 Lidsey Road, it is considered that the site is located within an *Urban Background* setting. As the site can be reasonably considered to be set in an *Urban Background* location, it is expected that pollutant concentrations in and around the site are likely to be similar to those identified at *Urban Background* monitoring sites within the wider local area.
- 6.29 However, as presented within their latest *ASR*⁹ (2023), ADC do not operate any *Urban Background* automatic and non-automatic monitors (diffusion tubes) within their authoritative boundary.

- 6.30 The closest non-automatic monitor to the application site is tube 26 (A29 Lidsey Road), located approximately 50m to the north-east of the site entrance. In 2022, this tube recorded an annual mean NO₂ concentration of 18.6 µg.m⁻³; 53.5% below the respective 40.0 µg.m⁻³ AQS. Noting the proximity of the tube to the application site's red line boundary, concentrations recorded at this tube can be considered representative of baseline NO₂ concentrations at the site entrance. However, noting that the closest proposed residence is distanced approximately 50m from the site boundary, baseline concentrations at the nearest receptors are likely to be further reduced in comparison.
- 6.31 Furthermore, UK-AIR background pollutant concentration estimates further indicate that NO₂, PM₁₀, and PM_{2.5} concentrations across the site are likely to be well below their relevant AQSs.
- 6.32 As such, national mapping of pollutant concentrations (UK-AIR) and local monitoring data suggests that the site is anticipated to be suitable for the introduction of the proposed residential dwellings.

7. Emissions Mitigation Assessment

Emission cost calculation

7.1 Following the January 2023 update to Defra's Emissions Cost Calculation guidance²¹, the emissions cost calculation below has been carried out to estimate the value of the impact of NO_x and PM_{2.5} emitted by the proposed development's operational traffic.

7.2 To evaluate the scale of a proposed development's total emissions, Defra recommends an emissions cost calculation using the following formula:

$$\text{Road Transport Emission Increase (Cost, £)} =$$

$$\text{Estimated trip rate for 5 years} \times \text{Emission Rate/10km/vehicle type} \times \text{Damage Costs}$$

7.3 The latest Defra Emissions Factor Toolkit²⁰ was used to determine the total transport related emissions that would be generated by the proposed development; the inputs used in the calculation are shown in Table 7.1 below. 2028 is the anticipated opening year of the proposed development, so the five-year period used in the calculation runs from 2028 to 2032 inclusive.

Table 7.1: Calculation Inputs

Input	Value	Unit	Source/guidance
Trip Length	10	km	AQEMGFS
Development Traffic Flow	590 (0 HDVs)	AADT	Highgate Transportation
EFT Road Type	Urban (not London)	-	EFT
EFT Year	2028 – 2032	-	In line with EFT estimates
Average Speed	50	km.hr ⁻¹	AQEMGFS
Appraisal period	5	years	AQEMGFS

7.4 The total emission 'damage' cost was calculated using Defra's appraisal toolkit and is presented in Tables 7.2 and 7.3.

7.5 The calculation accounts for an 'uplift factor' of 2% cumulatively per annum and a 'discount rate', in line with the latest 2023 guidance²¹. Central estimate damage costs for 'Road Transport Urban Medium' were based on Defra 2023 prices.

Table 7.2: Emission Cost Calculation for NO_x

	2028	2029	2030	2031	2032
NO _x increase (tonnes)	0.2565	0.2211	0.1893	0.1619	0.1392
Central Damage cost (NO _x)	£9,513	£9,513	£9,513	£9,513	£9,513
Adjusted Damage cost (NO _x)	£2,440	£2,072	£1,748	£1,473	£1,248
Total	£8,981				

Table 7.3: Emission Cost Calculation for PM_{2.5}

	2028	2029	2030	2031	2032
PM _{2.5} increase (tonnes)	0.0371	0.0369	0.0367	0.0365	0.0364
Central Damage cost (PM _{2.5})	£66,994	£66,994	£66,994	£66,994	£66,994
Adjusted Damage cost (PM _{2.5})	£2,488	£2,434	£2,384	£2,338	£2,296
Total	£11,941				

7.6 The total damage costs are summarised as follows:

NO_x emission 'damage' cost = £8,981 +

PM_{2.5} emission 'damage' cost = £11,941

TOTAL (cost, £) = £20,922

Mitigation

7.7 The resulting value of the 'emissions cost', as calculated above, is indicative of the value of an appropriate package of mitigation measures to minimise any potential impacts from the proposed development. The mitigation package should at least equate to this 'emissions cost'.

7.8 The proposed development will install EV charging infrastructure in line with the requirements of the latest Part S Building Regulations²⁴. This is further ratified by Arun District Council who stipulate that, as of 2022, this guidance will take precedence for future development within the district. Furthermore, additional on-street EV charging infrastructure will be provided.

7.9 In addition to the provision of EV charging infrastructure, the developer is committed to providing the following mitigation:

- ☛ A Travel Plan, including mechanisms to discourage high emission vehicle use and encourage uptake of low emissions technologies;
- ☛ "Cable to Property" broadband provision to enable working from home;
- ☛ Cycle Storage at each dwelling; and

24 The Building Regulations 2010. (2022). *Infrastructure for the Charging of Electric Vehicles*.

- ☉ Improvements/connections to cycle paths and the local cycle network, including enhanced connection to the A29 and wider footway improvements.

7.10 The scheme's proposed mitigation package is likely to **at least equate** to the calculated 'emissions cost'. This means that additional measures (listed within AQEMFGS¹⁶) do not need to be considered in this case.

8. Discussion

Construction Phase Impacts

- 8.1 The construction phase of the development could potentially give rise to emissions which could cause dust soiling effects on adjacent uses. Following the IAQM guidance¹³, the construction phase of the proposed development can be considered to be *High Risk* with regards to dust soiling effects, *Low Risk* for PM₁₀ health effects, and *Negligible Risk* for ecological impacts.
- 8.2 After the implementation of the mitigation measures listed in Appendix D, and in Paragraphs 5.23, the significance of each phase of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*, thus complying with the requirements of the NPPF.

Site Suitability

- 8.3 The assessment of site suitability found that the proposed development should not result in the exposure of new, sensitive residential receptors to levels of air pollution at risk of exceeding the UK AQSS.
- 8.4 Therefore, the site is considered to be suitable for the introduction of new residential receptors, and no further assessment of site suitability is considered necessary.

Operational Phase Impacts

- 8.5 Due to exceedances of the indicative screening thresholds prescribed by the EPUK & IAQM planning guidance¹², a detailed dispersion modelling assessment has been undertaken to predict the impact of the proposed development's operational traffic emissions on local air quality at existing sensitive receptor locations in the surrounding area.
- 8.6 Increases in NO₂ concentrations were predicted to have a *Slightly Adverse* impact at a total of two discrete model receptors. Both of these receptors are situated along the A29 Nyton Road and represent existing residential dwellings. Changes in NO₂ concentrations at all other modelled locations are described as *Negligible* with reference to the EPUK & IAQM guidance.
- 8.7 Each of the two modelled receptors that are expected to experience the *Slightly Adverse* impact were predicted to have an NO₂ concentration below the annual mean AQS for NO₂ in both the 2028 Without + Committed Development and 2028 With + Development scenarios. Whilst it is important to acknowledge that the proposed development is not anticipated to cause an exceedance of the annual mean AQS at either receptor, the predicted concentration at R16 is 37.2 µg.m⁻³ in the 2028 With + Development scenario.

- 8.8 All predicted increases in PM₁₀ and PM_{2.5} concentrations were assessed to be *Negligible* at each modelled receptor, which is considered to be not significant.
- 8.9 Defining the overall significance of the development's impact on local air quality is complex, with no specific criteria set out within the EPUK & IAQM guidance. The EPUK & IAQM guidance criteria states that whilst an individual receptor could experience a slight, moderate or substantial impact, the overall effect may not necessarily be judged as being significant. Any judgement on the overall significance of effect of a development should account for multiple factors, including the following:
- ✧ Air quality in the absence of the proposed development;
 - ✧ The geographical extent of impacts, most notably regarding population exposure; and
 - ✧ The influence of assumptions made during the assessment of impacts.
- 8.10 The geographical extent of the predicted *Slight* impacts (a total of two residences) is localised specifically to receptors located within very close proximity to the roadside of the A29 Nyton Road and is therefore highly limited.
- 8.11 Although not directly applicable to this assessment, Table 2.92N of the DMRB's Air Quality guidance¹⁵ states that *Slightly Adverse* impacts, as predicted at R14 and R16, should only be considered significant when 30 to 60 receptors are anticipated to be impacted by this degree of adversity. Receptors R14 and R16, on the A29 Nyton Road, represent residential units which are closest to the kerb. The two receptors are representative of very few residential units as a consequence, with most along the A29 Nyton Road being set back from the kerb. As such, if the DMRB criteria was used as a guide in this assessment, impacts along Nyton Road would not be considered significantly adverse.
- 8.12 It should also be acknowledged that the assessment uses a highly conservative approach to assess air quality by:
- ✧ Selecting existing receptors due to their locations as the closest residential dwellings to the pollutant source on their respective road links;
 - ✧ It was assumed that there will be no future improvement in background pollutant concentrations beyond 2022 for each modelled pollutant; and
 - ✧ Vehicle emission factors for 2022 were used to predict pollutant concentrations in the proposed development's anticipated opening year of 2028.
- 8.13 It is possible that the adverse impacts are being exacerbated by this conservative approach. Background concentration levels are anticipated to be lower in 2028 than background concentrations in 2022, as evidenced by the UK-AIR data presented in Table 3.2.

- 8.14 Additionally, due to the roll out of cleaner vehicles over time, even the *Slightly Adverse* predicted impacts along the A29 Nyton Road could potentially reduce within a few years of the proposed development being operational, especially bearing in mind that the development will include numerous measures to discourage private high-polluting vehicle use.
- 8.15 As such, providing the successful implementation of the mitigation measures listed within this report, the proposed development's impacts on air quality are likely to be minor and short-lived, which can be considered insignificant.

Emissions Mitigation Assessment

- 8.16 The Sussex-Air emissions mitigation guidance¹⁶ requires an Emissions Mitigation Assessment for all *Major* classified developments, to help minimise the potential for incremental impacts on local air quality.
- 8.17 Following Defra's latest Damage Cost guidance and guidance from the Sussex-air partnership, an 'emissions cost' was calculated as a result of NO_x and PM_{2.5} emissions expected to be generated by traffic associated with the scheme, in its first five operational years.
- 8.18 Current plans to offset potential air quality impacts include the provision of EVCP in line with national (Part S Building Regs) and local policy, cycle storage facilities, the implementation of a Travel Plan, and improvements/connections to cycle paths and the local cycle network, amongst other measures. Noting the provision of EVCP to be provided, including additional on-street EVCP infrastructure, it is anticipated that the proposed mitigation measures will offset the calculated 'Damage Cost'.
- 8.19 Whilst the AQS' have not been breached at any modelled receptor within this assessment, future developments within the local area should consider implementing emission-reducing strategies and initiatives to reduce potential cumulative impacts on local, existing receptors.

9. Conclusions

- 9.1 Phlorum Ltd has been commissioned by Hanbury Properties to undertake an Air Quality Assessment to support an outline planning application for a proposed residential development on Land at Woodgate Nurseries, Lidsey Road, Woodgate. The proposals encompass a residential development with up to 130 dwellings (Use Class C3), informal and formal public open space, landscaping, drainage, and other associated works.
- 9.2 UK-AIR background concentrations and local air quality monitoring results from the wider area suggest that air quality within the vicinity of the application site is good, with background pollution concentrations across the site likely to be below relevant UK Air Quality Standard concentrations.
- 9.3 The construction phase of the development could give rise to emissions which could cause dust soiling effects on adjacent uses. However, by adopting appropriate mitigation measures to reduce emissions and their potential impact, residual effects should be negligible, thus complying with the requirements of the National Planning Policy Framework.
- 9.4 The operation of the proposed development is not expected to introduce new receptors into an area of poor air quality.
- 9.5 Furthermore, the operation of the proposed development is not considered to have an overall significant adverse effect on local air quality, despite small, isolated *Slightly Adverse* impacts at select receptors on the A29 Nyton Road.
- 9.6 To mitigate for future emissions, the development will include mitigation measures, as listed in Section 7 of this report. Noting the suite of mitigation measures proposed, including additional on-street EVCP infrastructure, it is anticipated that these measures include a reasonable level of air quality mitigation to offset the development's calculated 'Damage Cost'.
- 9.7 Provided that suitable mitigation is implemented to offset potential emissions once operational, the proposed development is expected to comply with all relevant local and national air quality policy. Air quality should not, therefore, pose any significant obstacles to the planning process.

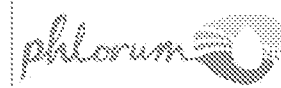
Figures and Appendices

Figure 1: Site Location



Figure 1: Site Location Plan

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Figure 2: Construction Phase

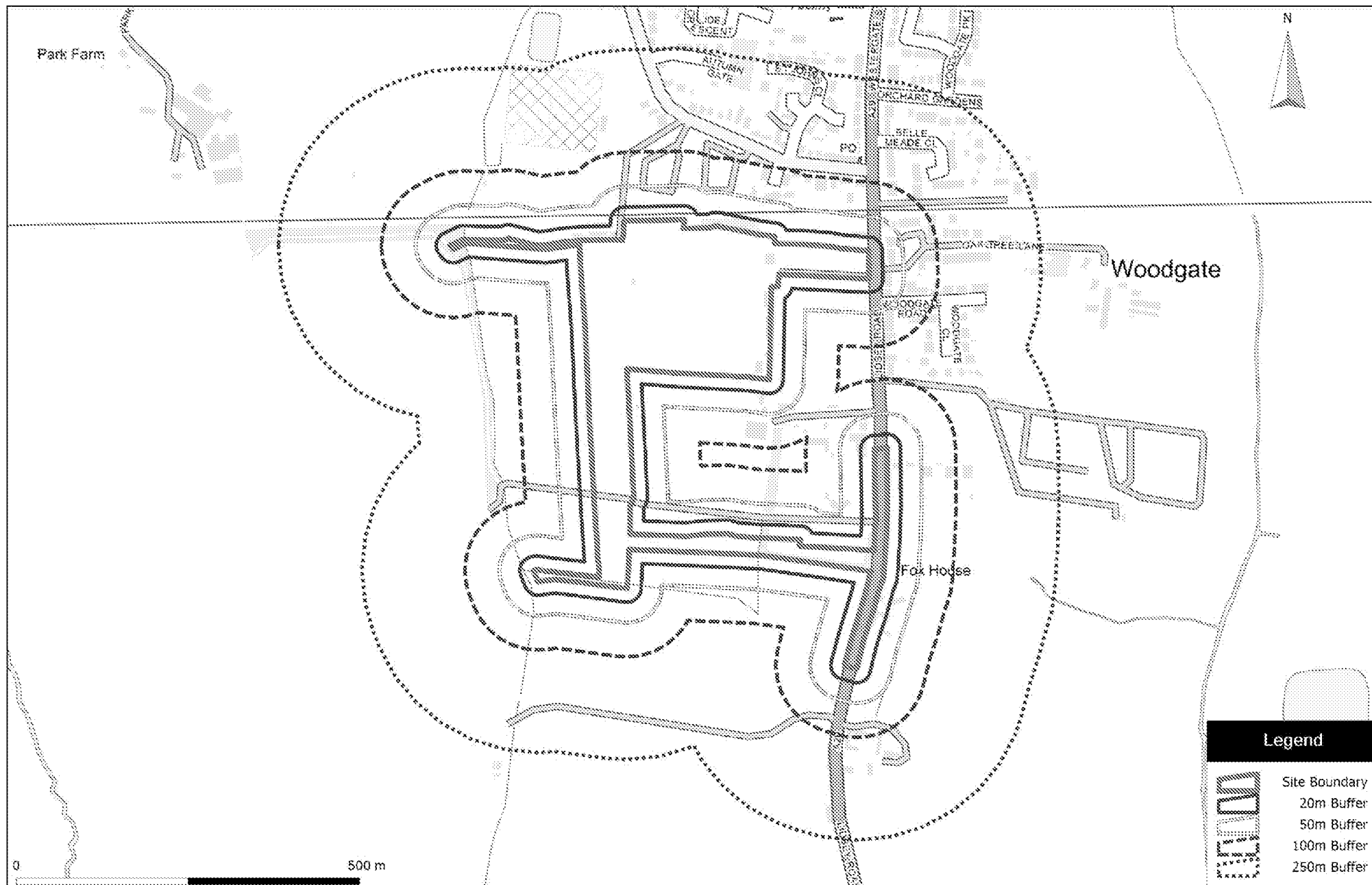
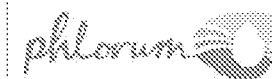


Figure 2: Construction Phase

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Figure 3a: Modelled Roads and Receptors

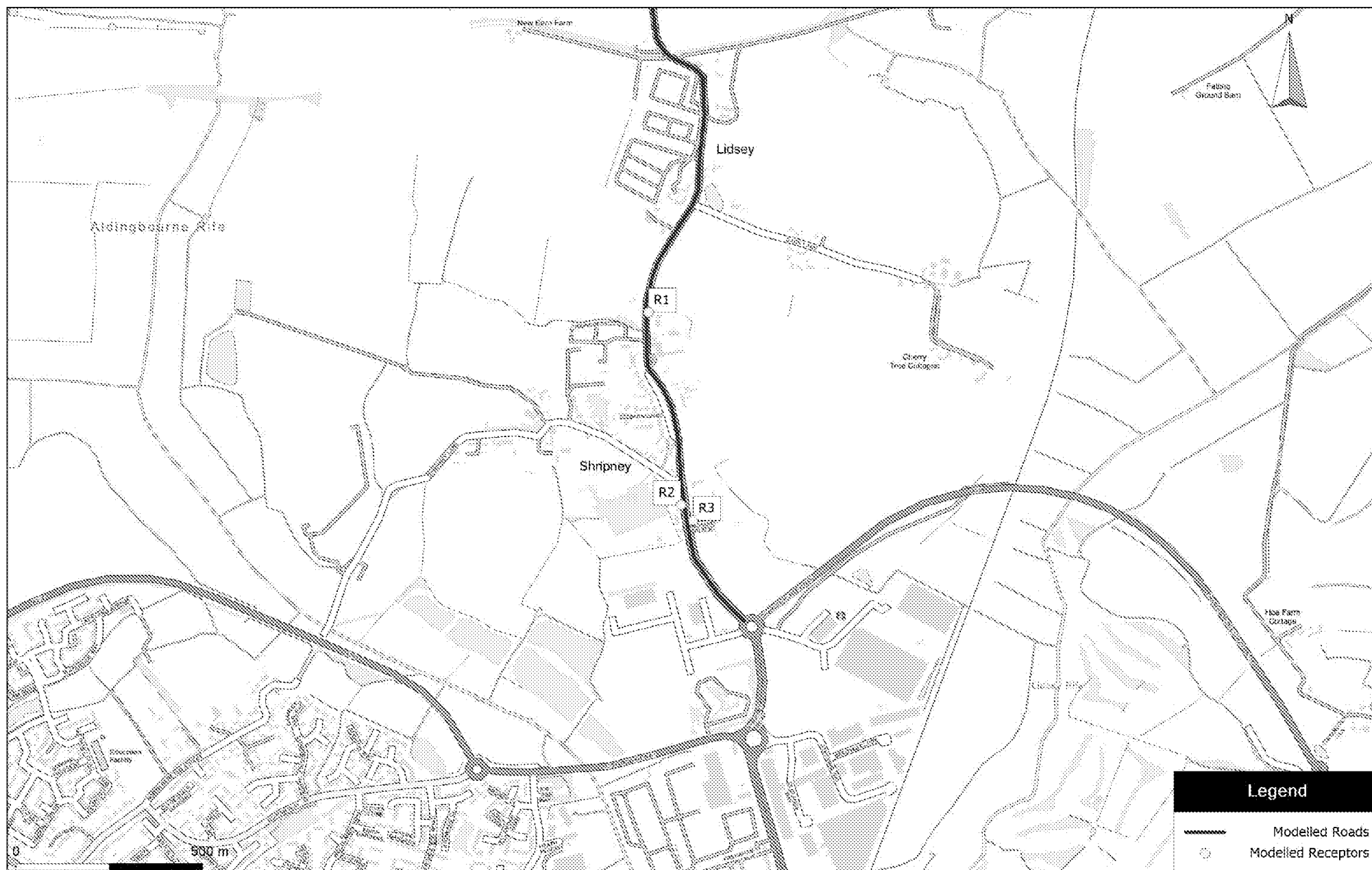
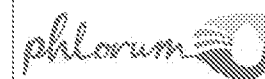


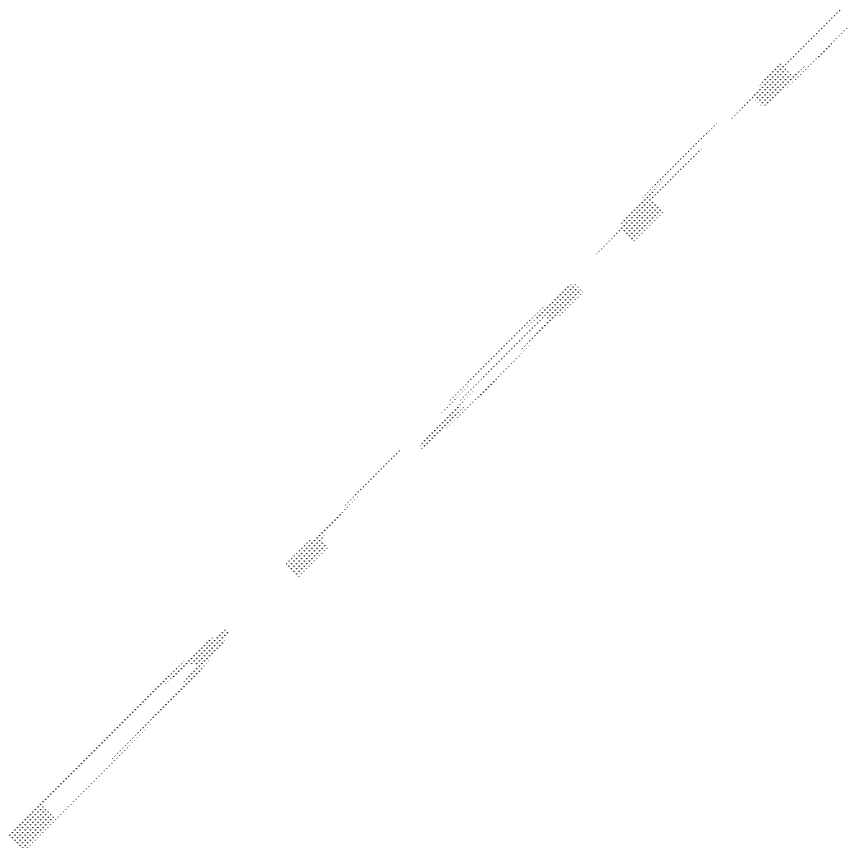
Figure 3a: Modelled Roads and Receptors

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Figure 3b: Modelled Roads and Receptors



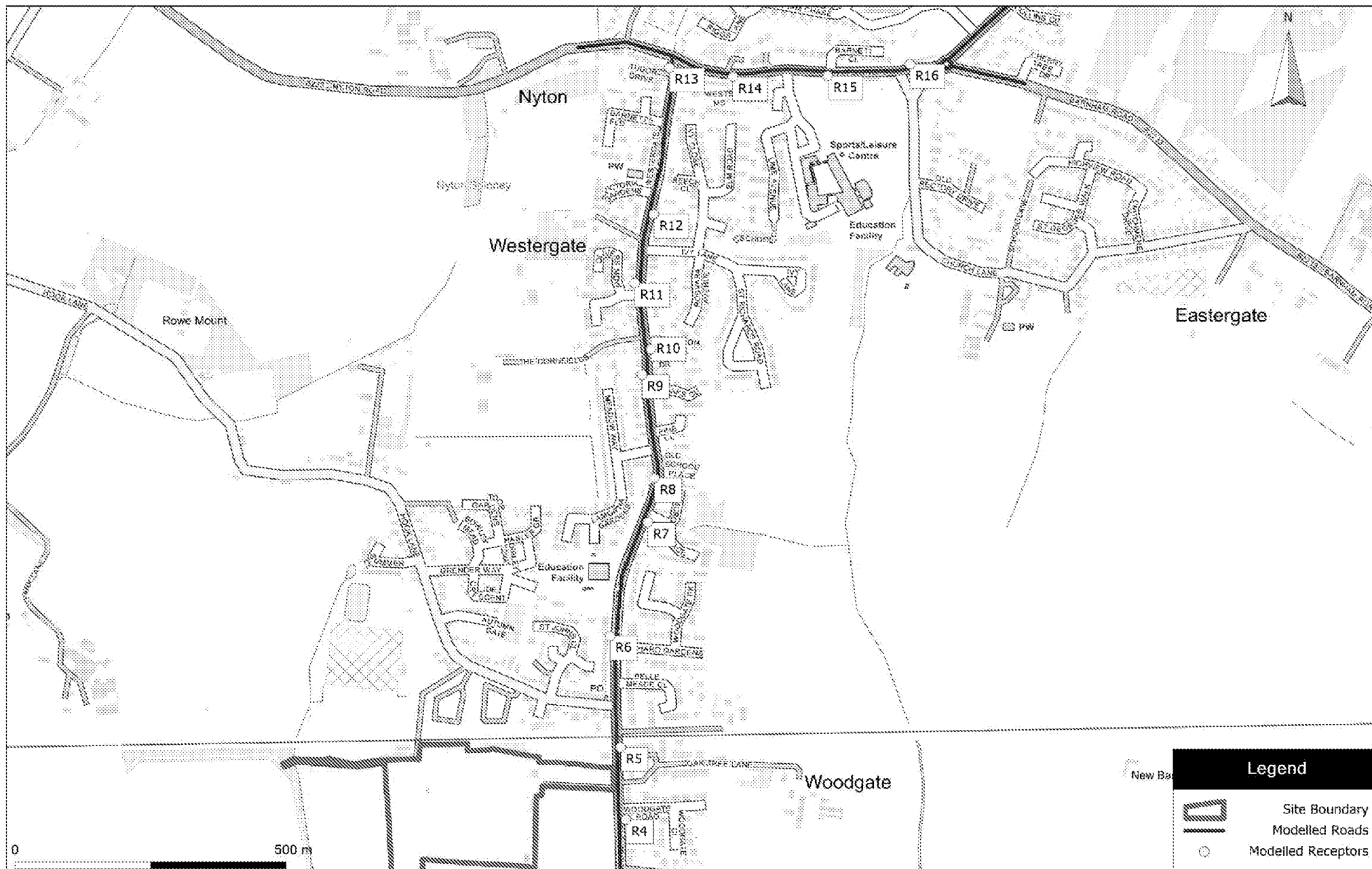
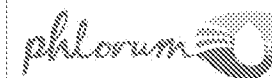


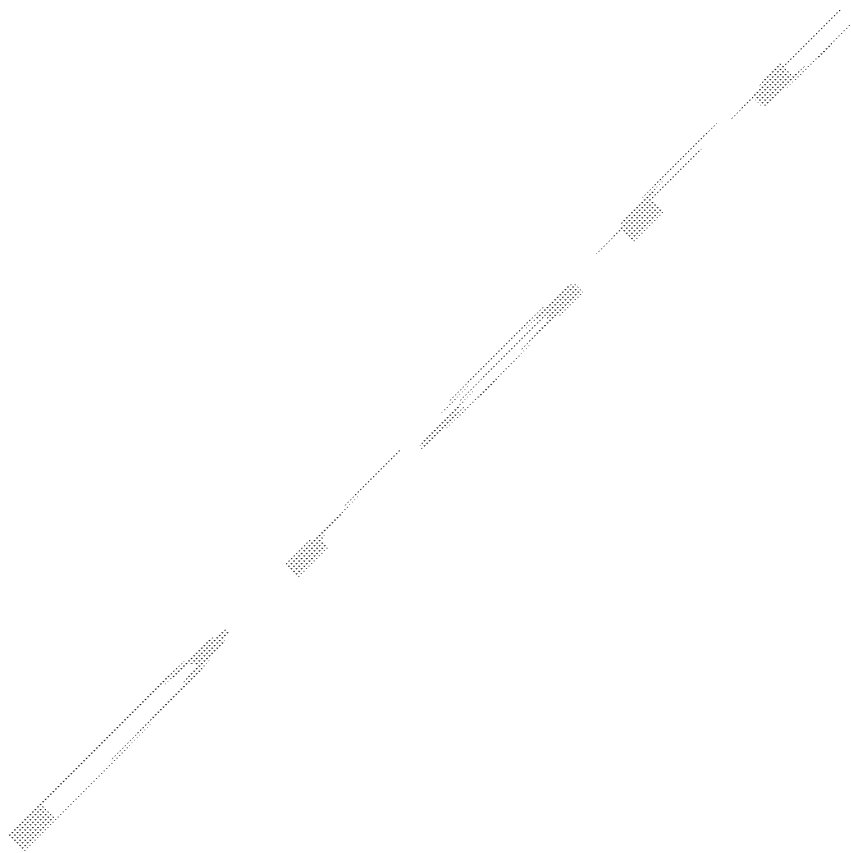
Figure 3b: Modelled Roads and Receptors

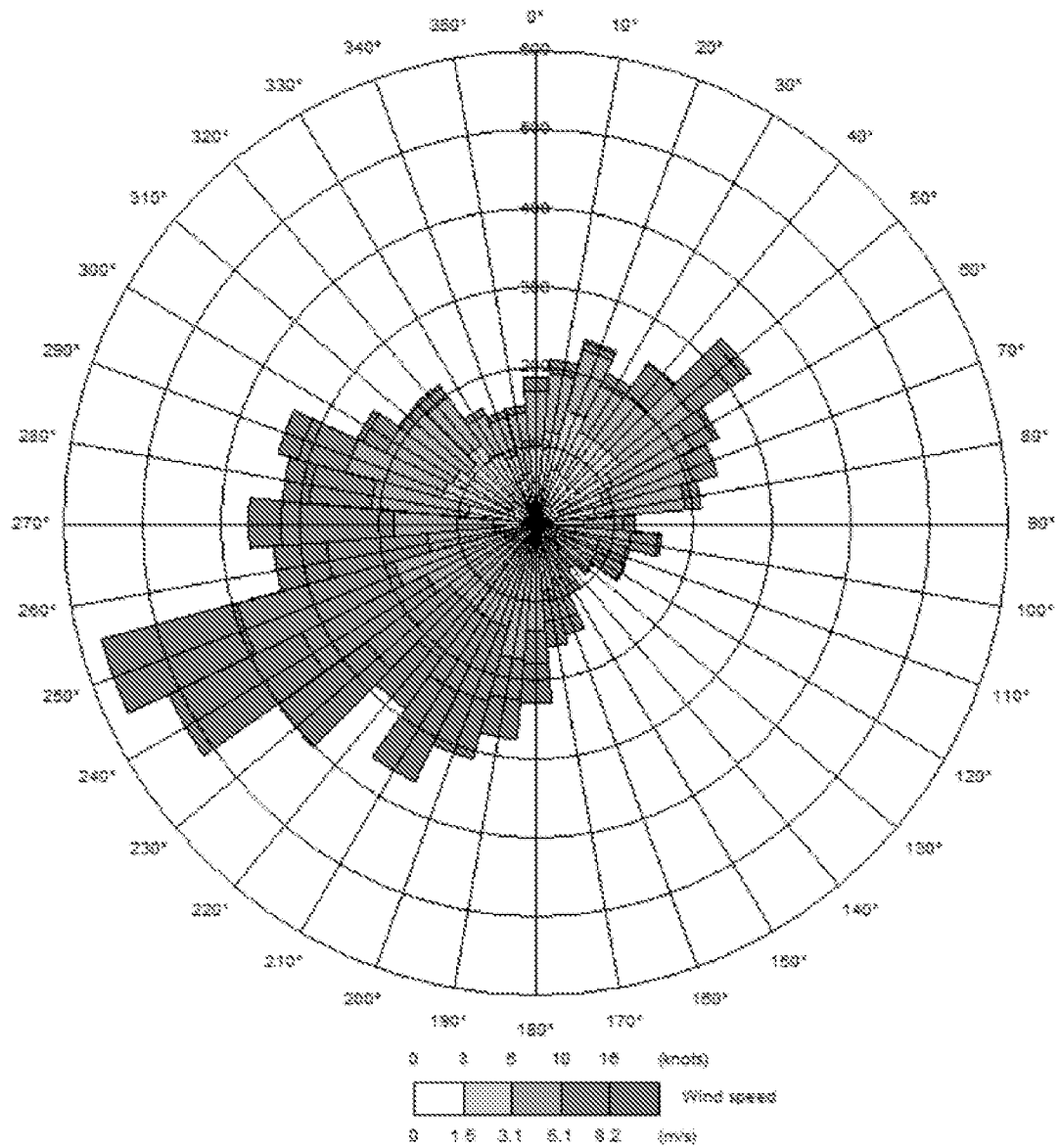
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Figure 4: Wind Rose for Thorney Island (2022)





Appendix A: EPUK & IAQM Significance Criteria

Table A.1: IAQM Impact Descriptors for Individual Receptors (Based on Table 6.3 from the EPUK & IAQM guidance)

Long-term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
75-94% 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

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Appendix B: Model Input Data

Model Inputs

Model inputs are provided below in Tables B.1 and B.2. These data relate to ADMS Roads inputs for model verification and the assessment modelling.

Table B.1: Verification Inputs

Inputs	
Dataset	UK EFT v12.0.1 (2VC)
Emission Year	2022
Road Type	England (Urban)

Table B.2: Operational Inputs

Inputs	
Dataset	UK EFT v12.0.1 (2VC)
Emission Year	2022
Road Type	England (Urban)

Traffic Data

Traffic data used within the assessment was provided by Highgate Transportation (HT), the transport consultants assigned to the project. The data analysed included that of the baseline modelling year of 2022, as well as the development's projected opening year of 2028 (with and without the proposed development).

The AADT data used in the ADMS-Roads assessment are included in Table A.3, below.

Table A.3: Traffic Inputs for the ADMS-Roads Assessment

Road	2022 Baseline		2028 Without Development		2028 With Development		Source
	AADT	% HDVs	AADT	% HDV	AADT	% HDV	
A29 (South of Site)	10,316	4.7%	11,861	4.5%	12,686	4.2%	HT
A29 (North of Site)	13,880	2.9%	16,098	2.7%	16,998	2.5%	HT
B2233 Nyton Road (North Fork)	3,115	2.3%	3,670	2.0%	3,877	1.9%	HT
B2233 Nyton Road (West)	8,940	2.2%	9,894	2.2%	10,101	2.1%	HT
B2233 Nyton Road (East)	5,825	2.2%	6,224	2.2%	6,224	2.2%	HT
A29 Nyton Road	16,405	2.8%	18,224	2.6%	18,922	2.5%	HT
Roundabout	13,395	2.7%	14,729	2.6%	15,194	2.5%	HT

Road	2022 Baseline		2025 Without Development		2028 With Development		Source
	AADT	% HDVs	AADT	% HDV	AADT	% HDV	
A29 Fontwell Avenue	12,720	2.6%	13,841	2.5%	14,260	2.5%	HT
B2233 Barnham Road	11,060	2.8%	12,122	2.7%	12,401	2.6%	HT

Appendix C: Model Verification Study

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(22)¹¹.

According to LAQM.TG(22)¹¹, no adjustment factor is necessary where the results of the model all lie within 25% of monitored concentrations.

Model verification can only be undertaken where there are sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. LAQM.TG(22) recommends that a combination of automatic and diffusion tube monitoring data are used; although this may be limited by data availability. Three monitoring locations with appropriate traffic data were selected for this model verification study.

Table B.1 compares monitored and modelled NO₂ concentrations at the three monitoring locations.

Table C.1: Monitored and Modelled Road Contributions of NO₂ at Roadside Monitoring Sites

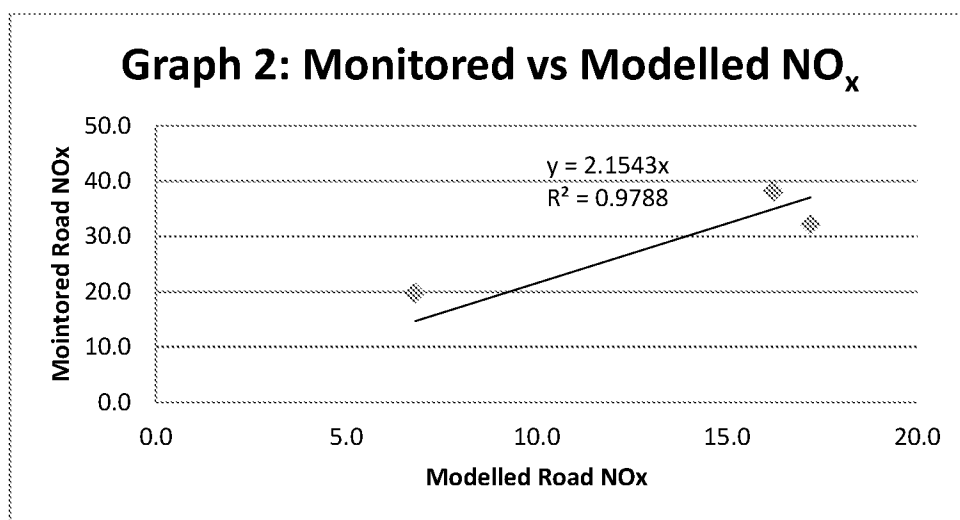
Monitor ID	Type	Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
2a & 2b	DT	27.1	19.7	-27.3%
6	DT	30.0	19.2	-36.0%
1	DT	21.0	14.2	-32.3%

Note: DT = Diffusion Tube.

The data in Table C.1 show that the model is systematically underestimating concentrations at each of the selected monitoring locations. This is a pattern frequently seen in model verification studies and is likely to be the result of local dispersion characteristics. Furthermore, as all three modelled values were outside 25% of the corresponding monitored results, it was decided to proceed with adjustment as the model was systematically under predicting NO₂ concentrations.

As it is primary NO_x, rather than secondary NO₂ emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. Plots of modelled versus monitored NO_x concentrations on a graph shows a positive correlation. The graph is included in Figure C.2 below.

Figure C.2 Monitored vs Modelled Road NO_x



By plotting a trend line through the points on the graph, a factor of **2.15** was derived. Table C.3 shows total monitored versus modelled NO₂ following the adjustment of the road contribution of NO_x by this factor. It shows that, following this adjustment, all modelled concentrations of NO₂ are within 25% of monitored concentrations at these locations. As a result, the adjustment factor was considered appropriate for the adjustment of modelled road contributions of NO_x for the assessment of the proposed development.

Table C.3: Monitored and Adjusted Modelled Total NO₂ at Roadside Monitoring Sites

Monitor ID	Type	Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
2a & 2b	DT	27.1	29.5	8.7%
6	DT	30.0	28.5	-5.1%
1	DT	21.0	18.4	-12.5%

Note: DT = Diffusion Tube

As there is insufficient PM₁₀ or PM_{2.5} monitoring data in the study area, it was not possible to perform model verification for these pollutants. As such, the NO_x/NO₂ adjustment factor (2.15) has also been applied to PM₁₀ and PM_{2.5} model results, in accordance with LAQM.TG(22)¹¹.

Appendix D: IAQM Highly Recommended Mitigation Measures for *High* Risk Sites

Appendix D: IAQM Highly Recommended Mitigation Measures for sites with a *High* Risk of Dust Impacts

Please refer to the IAQM's *Guidance on the Assessment of Dust from Demolition and Construction (2024)*¹³ and *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (2018)*²⁵ for further, "desirable", mitigation measures.

Communications

- ❖ Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- ❖ 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 Appendix. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

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 exception incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- ❖ Hold regular liaison meetings with other high risk construction sites within 250 m 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.

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 window sills within 100 m of site boundary, with cleaning to be provided if necessary.
- ❖ Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.

25 Institute of Air Quality Management. (2018). *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites*.

- ☞ Increase the frequency of 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 PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by the IAQM on monitoring during demolition, earthworks and construction.

Preparing and Maintaining the Site

- ☞ Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- ☞ Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- ☞ Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- ☞ Avoid site 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.

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.
- ☞ Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 00 mph on un-surfaced 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).
- ☞ Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- ☞ Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking and car-sharing).

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 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.

Waste Management

- ❖ Avoid bonfires and burning of waste materials.

Demolition

- ❖ Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- ❖ Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- ❖ Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- ❖ Bag and remove any biological debris or damp down such material before demolition.

Earthworks

- ❖ Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- ❖ Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- ❖ Only remove the cover in a small areas during work and not all at once.

Construction

- ❖ Avoid scabbling if possible.
- ❖ 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.
- ❖ 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.

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.
- ❖ Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- ❖ Record all inspections of haul routes and any subsequent action in a site log book.
- ❖ Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- ❖ Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior leaving the site where reasonably practicable).
- ❖ Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- ❖ Access gates to be located at least 10m from receptors where possible.

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