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**AIR QUALITY ASSESSMENT**

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## **1.0 INTRODUCTION**

### **Proposed Development**

- 1.1 Ardent Consulting Engineers (ACE) have been commissioned by Bellway Homes Ltd. (South London) to carry out an air quality assessment (AQA) in support of a planning application for a proposed residential development located within the jurisdiction of Horsham District Council (HDC).
- 1.2 The proposal is for the construction and associated landscaping of a 180-unit residential dwelling development, comprising two residential blocks and private housing.

### **Scope**

- 1.3 This report describes baseline air quality within the study area and considers both the suitability of the Site for the proposed development and the potential impact of the proposed development on local air quality during both the construction and the operational phases.
- 1.4 The main air pollutants of concern related to the construction phase are:
- dust and particulate matter (PM<sub>10</sub>) from on-site construction activities and as a result of material tracked out by construction vehicles;
  - emissions of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) from construction vehicle emissions, which may impact on existing properties; and
  - emissions of nitrogen oxides (NO<sub>x</sub>), NO<sub>2</sub> and ammonia (NH<sub>3</sub>) which may impact on existing designated ecological sites
- 1.5 The main air pollutants of concern related to the operational phase impacts are:
- emissions of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> associated with operational traffic generation, which may impact on existing properties;
  - concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> within the Site which may impact on proposed sensitive land uses, associated with emissions from the local road network and background concentrations; and

- emissions of NO<sub>x</sub>, NO<sub>2</sub> and NH<sub>3</sub> from operational traffic generation which have the potential to impact nearby designated ecological sites.
- 1.6 The proposed energy strategy is anticipated to be comprised of individual gas boilers (i.e. designed to serve a single property) for approx. 50 residential units, with the remaining units being served by Air Source Heat Pumps (ASHPs). Taking into consideration the relatively low volume of emissions associated with each individual boiler (they are anticipated to be low-NO<sub>x</sub> boilers, i.e. <40 kg nitrogen oxides (NO<sub>x</sub>) / kWh), and that the emissions sources are expected to be widely dispersed across the Site (as opposed to being concentrated at a single point), the potential overall effect of emissions from the proposed boiler plant can be screened out as being 'not significant'. The proposed ASHPs will not result in any on-site emissions, therefore, the overall effect of the ASHPs can also be screened out as being 'not significant'.
- 1.7 The AQA also includes the calculation of damage costs associated with operational development-generated traffic, as well the identification of a number of potentially suitable mitigation measures.

## 2.0 LEGISLATION, POLICY AND GUIDANCE

### National Air Quality Legislation and Strategy; Human Health

#### *The Air Quality Strategy*

- 2.1 The Air Quality Strategy (Defra, 2007) established the policy framework for ambient air quality management in the UK, with the objective of ensuring a quality of ambient air for all that would not pose a significant risk to health or quality of life. This document set out the National Air Quality Objectives (NAQOs) and the policy for achieving them. It followed part IV of the Environment Act (UK Government, 1995) which introduced a system of Local Air Quality Management (LAQM) requiring local authorities to regularly review and assess air quality within their boundary and appraise plans in light of these assessments.
- 2.2 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) which should include measures expected to ensure that the NAQOs are met within the AQMA.

#### *National Air Quality Objectives*

- 2.3 NAQOs were defined by The Air Quality Strategy (Defra, 2007) and enshrined in regulations by the Air Quality Standards Regulation (Statutory Instrument, 2010, No 1001) and Air Quality Standards (Amendment) Regulations (Statutory Instrument, 2016 No. 1184) which implemented the European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC). Relevant objectives are set out in **Table 2-1**.
- 2.4 The Environment Act 2021 (UK Government, 2021) establishes a legally binding duty on government to set a long-term target for at least one air quality matter, in addition to a separate requirement to set a target regarding annual mean PM<sub>2.5</sub> concentrations, by October 2022. An online consultation was undertaken regarding the proposed new targets<sup>1</sup> (Defra, 2022a) between March and June 2022. These proposed new targets are still subject to consultation and approval and, if

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<sup>1</sup> Proposed air quality targets are 1) Annual Mean PM<sub>2.5</sub> Concentration Target of 10 µg/m<sup>3</sup> to be met across England by 2040; and 2) Population Exposure PM<sub>2.5</sub> Reduction Target of a 35% reduction in population exposure by 2040 (as compared to a base year of 2018).

approved, would be binding from 2040. Therefore, the consideration of air quality within this AQA is undertaken in the context of the currently approved objectives only, as set out in **Table 2-1**.

**Table 2-1: NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> Objectives**

| Pollutant                               | Time Period               | Objective                                                                      |
|-----------------------------------------|---------------------------|--------------------------------------------------------------------------------|
| Nitrogen Dioxide (NO <sub>2</sub> )     | 1-hour mean               | 200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year             |
|                                         | Annual mean               | 40 µg/m <sup>3</sup>                                                           |
| Particulate Matter (PM <sub>10</sub> )  | 24-hour mean              | 50 µg/m <sup>3</sup> not to be exceeded more than 35 <sup>2</sup> times a year |
|                                         | Annual mean               | 40 µg/m <sup>3</sup> <sup>3</sup>                                              |
| Particulate Matter (PM <sub>2.5</sub> ) | Annual mean               | 25 µg/m <sup>3</sup> <sup>4</sup>                                              |
|                                         | Annual mean               | 20 µg/m <sup>3</sup> <sup>5</sup>                                              |
|                                         | Exposure reduction target | 15% reduction between 2010 and 2020 at Urban Background sites                  |

2.5 Analysis of long-term monitoring data suggests that if the annual mean NO<sub>2</sub> concentration is less than 60 µg/m<sup>3</sup> then the 1-hour mean NO<sub>2</sub> objective is unlikely to be exceeded where road transport is the main source of pollution (Defra, 2022b). This concentration has therefore been used in this AQA to screen whether an exceedance of the 1-hour mean NO<sub>2</sub> objective is likely. Similarly, an annual mean PM<sub>10</sub> concentration of 32 µg/m<sup>3</sup> is used to screen whether an exceedance of the 24-hour mean PM<sub>10</sub> objective is likely.

<sup>2</sup> 7 times a year for Scotland

<sup>3</sup> 18 µg/m<sup>3</sup> for Scotland

<sup>4</sup> 12 µg/m<sup>3</sup> for Scotland

<sup>5</sup> Indicative stage 2 limit value post 2020, derived based on the exposure reduction target of a 15% reduction between 2010 and 2020. This value has been used as the relevant air quality objective throughout this assessment in order to ensure a conservative approach.

- 2.6 Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22)) (Defra, 2022b) provides guidance to local authorities as to where objectives apply. These are summarised in **Table 2-2**.

**Table 2-2: Relevant Exposure**

| Averaging Period | Relevant Locations                                                         | Objectives should apply                                                                                       | Objectives don't usually apply                                                  |
|------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Annual mean      | Where individuals are exposed for a cumulative period of 6 month in a year | Facades of residential properties, schools and hospitals                                                      | Gardens, facades of offices, hotels and shops or kerbside sites                 |
| 24-hour mean     | Where individuals are expected to be exposed for 24-hours or longer        | As above, with the addition of hotels and gardens of residences                                               | Kerbside sites and areas where the public is unlikely to spend significant time |
| 1-hour mean      | Where individuals are expected to spend one hour or longer                 | As above, with the addition of locations with regular access such as car parks, bus stations, parks and cafes | Locations not publicly accessible or where occupation is not regular            |

***National Air Quality Plan for Nitrogen Dioxide (NO<sub>2</sub>) in the UK***

- 2.7 The National Air Quality Plan (Defra and DfT, 2017) was written as a joint venture between The Department for Environment, Food and Rural Affairs (Defra) and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO<sub>2</sub> in the UK. It includes a number of measures such as those aimed at investing in Ultra Low Emission Vehicles (ULEVs) charging infrastructure, public transport and grants to help local authorities in improving air quality.
- 2.8 The plan requires all local authorities in England with areas expected not to meet the Objectives by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in "*the shortest time possible*". These plans are to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the local authority may need to consider implementation of

a Clean Air Zone which places restrictions on vehicle access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

### ***The Road to Zero Strategy***

- 2.9 The 'Road to Zero' strategy (HM Government, 2018) set out the governments aims regarding zero emissions vehicles. These include the aim that all new cars and vans have zero tailpipe emissions by 2040 and for almost every car to be zero emission by 2050. Measures are aimed at encouraging uptake of the cleanest vehicles and supporting electric charging infrastructure.

### ***Clean Air Strategy***

- 2.10 The Clean Air Strategy (Defra, 2019) sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with PM<sub>2.5</sub> concentrations exceeding 10 µg/m<sup>3</sup> by 50% by 2025.

### **National Air Quality Legislation; Ecology**

- 2.11 Poor air quality can have a negative impact on ecological habitats as well as human health. The Conservation of Habitats and Species Regulations (Statutory Instrument, 2017) was put in place in order to protect ecological sites following the publication of European Directive 92/43/EEC (European Economic Community (EEC), 1992) regarding the designation of Special Areas of Conservation (SAC) and 2009/147/EC (European Community, 2009) regarding the designation of Special Protection Areas (SPAs). These regulations require that the competent authority (the planning authority in this case) consider whether a development will have a likely significant effect on an SAC or SPA (known as 'European Sites'). Should this be considered to be likely then an 'appropriate assessment' is required to identify whether the new development will indeed have a significant adverse effect on the ecological site(s).
- 2.12 The Wildlife and Countryside Act (UK Government, 1981) sets out the requirement for the identification of areas of land that are considered to be of 'special interest' (due to flora, fauna and / or geological or physiographical features) as Sites of Special Scientific Interest (SSSIs), and the Countryside and Rights of Way (CROW)

Act (HM Government, 2000) sets out the specific protections afforded to SSSI, stating that where a development is 'likely to damage' a SSSI then the appropriate conservation body must be consulted. The Environment Act (UK Government, 1995) and the Natural Environment and Rural Communities Act (HM Government, 2006) set out a general requirement for conservation of biodiversity.

## **Planning Policy**

### ***National Planning Policy***

- 2.13 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) sets out the Government's planning policies for England and how they expect these to be implemented. Consideration of air quality within planning is considered an important element of this framework which recommends that transport and the potential impact on the environment should be considered at an early stage in order to allow for mitigation or even avoidance of impacts through location and layout of developments.
- 2.14 It is recommended that both the impacts of a potential development on the environment and the risk to new development from existing pollution be taken into account when planning policy is drafted. Furthermore these should contribute to compliance with relevant limit values or objectives and should be consistent with any local AQAP.
- 2.15 The NPPF also recommends that *"existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*
- 2.16 The NPPF also states that:

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

- Protecting and enhancing...sites of biodiversity or geological values...*
- minimising impacts on...biodiversity..."*

- 2.17 The Planning Practice Guidance (PPG) provides guidance on how planning can enact the policies set out in NPPF. It is set out as separate papers for different sectors and, therefore, the 'Air Quality' PPG (Ministry of Housing, Communities and Local Government, 2019) is aimed at addressing policy relating specifically to air quality. This document gives guidelines for when air quality is likely to be relevant to a planning decision:

*"Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."*

- 2.18 The 'Air Quality' PPG also states that more detailed information such as whether the development could have a significant impact on air quality, baseline air quality and whether occupiers of the development could experience poor air quality may be required in order to make an informed decision. Further, it notes that any assessment should be proportionate, taking into account the scale of the proposed development, as well as any potential impacts.
- 2.19 Some suggestions on mitigation measures are set out within the PPG, such as separation distances, filtration/ventilation, green infrastructure, promotion of low emission forms of transport, control of dust and emissions from construction and, finally, contributing funding to measures such as those identified in AQAPs to offset impacts from the development.

## **Regional Policy**

### **West Sussex Air Quality Plan 2020**

- 2.20 West Sussex County Council (WSCC) published their Air Quality Plan (WSCC, 2020) in January 2020 that provides information about air quality across the County, and outlines measures being taken to reduce levels of pollution.

## Local Policy

### Horsham District Planning Framework

2.21 HDC is currently undergoing the process of reviewing the Local Plan. The Draft Horsham District Local Plan 2019-2036 (HDC, 2019) contains the following two relevant policies:

- Policy 25 'Strategic Policy: Environmental Protection' states that *"The high quality of the District's environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to, and the emission of, pollutants including...air...pollution arising from all stages of development. Development proposals must ensure that they:...*

*...minimise the air pollution...emissions in order to protect human health and the environment;*

*Contribute to the implementation of local Air Quality Action Plans and do not conflict with its objectives;*

*Maintain or reduce the number of people exposed to poor air quality including odour. Consideration should be given to development that will result in new public exposure, particularly where vulnerable people (e.g. the elderly, care homes or schools) would be exposed to the areas of poor air quality; and*

*Ensure that the cumulative impact of all relevant committed developments is appropriately assessed"; and*

- Policy 26 'Air Quality' states that *"The Council recognises the importance of the management of air quality. Taking into account any relevant Planning Guidance Documents, proposals will be required to:*
  1. *Take account of The Air Quality and Emissions Mitigation Guidance for Sussex (2019), or any future updates. Major development proposals and proposals within an Air Quality Management Area (AQMA), or in relevant proximity to an AQMA, must be accompanied*

*by an Air Quality Impact Assessment and an Emissions Mitigation Assessment;*

2. *Contribute to the implementation of local Air Quality Action Plans, and not conflict with the set objectives;*
3. *Minimise traffic generation and congestion through access to sustainable transport modes, maximising the provision for cycling and pedestrian facilities;*
4. *Encourage the use of cleaner transport fuels, including through the provision of electric car charging points;*
5. *Mitigate the impact on the amenities of users of the site and surrounding land to an appropriate level, where development creates or results in pollution including particulates, dust, smoke, pollutant gases or odour; and*
6. *Ensure that the cumulative impact of all relevant committed developments is appropriately assessed".*

2.22 Until the draft new Local Plan is adopted, the Horsham District Planning Framework (HDC, 2015), published in November 2015, remains applicable. This document contains the following two relevant policies:

- Policy 2 'Strategic Policy: Strategic Development' states that "*To maintain the district's unique rural character whilst ensuring that the needs of the community are met through sustainable growth and suitable access to services and local employment, the spatial strategy to 2031 is...retaining and enhancing environmental quality including air...*"; and
- Policy 24 'Strategic Policy: Environmental Protection' states that "*The high quality of the district's environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to and the emission of pollutants including...air...pollution and ensure that they...*

*...Minimise the air pollution...emissions in order to protect human health and the environment;*

*Contribute to the implementation of local Air Quality Action Plans and do not conflict with its objectives;*

*Maintain or reduce the number of people exposed to poor air quality including odour. Consideration should be given to development that will result in new public exposure, particularly where vulnerable people (e.g. the elderly, care homes or schools) would be exposed to the areas of poor air quality; and*

*Ensure that the cumulative impact of all relevant committed developments is appropriately assessed”.*

- 2.23 HDC has declared two AQMAs ('Horsham AQMA No. 1' and 'Horsham Cowfold AQMA', declared in 2010 and 2011 respectively), both as a result of exceedances of the annual mean NO<sub>2</sub> objective. An AQAP has since been developed by HDC in September 2013 (HDC & Sussex-air Air Quality Partnership, 2013). The AQAP identified a range of possible measures aimed at improving air quality within Cowfold.

### **Assessment Guidance**

- 2.24 This assessment has been based on a number of guidance documents, the most significant of which are set out below:

#### ***Local Air Quality Management Technical Guidance (LAQM.TG(22))***

- 2.25 The LAQM.TG(22) guidance (Defra, 2022b) was published for use by local authorities in review and assessment work, but also includes a number of technical guidelines on carrying out modelling assessment and management of monitoring data which set out best practice and are, therefore, relevant to all air quality assessments.

#### ***Land-Use Planning and Development Control: Planning for Air Quality***

- 2.26 The Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) have published joint guidance on the assessment of air quality impacts for planning purposes (EPUK & IAQM, 2017). This includes information on when an air quality assessment is required, what should be included in an assessment and the assessment of significance.

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***Guidance on the Assessment of Dust from Demolition and Construction***

- 2.27 The IAQM have produced guidance which includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout (IAQM, 2014). This is then used to identify the level of mitigation necessary in order for the impacts to be not significant.

***A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites***

- 2.28 The IAQM guidance, 'Assessment of Air Quality Impacts on Designated Nature Conservation Sites' (IAQM, 2020) sets out the appropriate approach for this element of assessment. Due to the complexity of ecological impacts, an air quality professional alone can only identify whether emissions are unlikely to have a significant impact when compared against the relevant critical load / level. Where it cannot be ascertained that emissions are below this level, the combined input of both an air quality professional and an ecologist is required; the former to identify any changes to concentrations of deposition and the latter to consider the overall effect taking into consideration the location and sensitivity of any given habitat.

***Air Quality and Emissions Mitigation Guidance for Sussex***

- 2.29 The Sussex-Air Air Quality Partnership published an updated version of the 'Air quality and emissions mitigation guidance for Sussex (2021)' (Sussex-air Air Quality Partnership, 2021) in April 2021. This guidance details when it is necessary to undertake an AQA and outlines standard mitigation requirements for developments.
- 2.30 The guidance details the Emissions Mitigation Assessment (EMA) and Emissions Mitigation Statement (EMS) procedure that should be followed, including a method for calculating damage costs associated with a proposed development and recommendation of mitigation measures.

***Air Quality Appraisal; Damage Cost Guidance***

- 2.31 The latest version of the 'Air Quality Appraisal; Damage Cost Guidance' was published by Defra in March 2021 (Defra, 2021a). This guidance details the process for assessing the air quality impact of a project and sets out damage cost

values for five pollutants. The guidance also references the 'Damage Costs Appraisal Toolkit' which can be used in conjunction with the guidance to calculate damage costs associated with a proposed development; the latest version of the Toolkit is dated 2021 (Defra, 2021b).

### **3.0 METHODOLOGY**

- 3.1 The methodology set out in the following sections has been identified as being the most appropriate approach to assess potential impacts associated with the proposed development and whether these impacts are acceptable, along with any required mitigation.

#### **Baseline Air Quality**

- 3.2 Information regarding 'current'<sup>6</sup> and future<sup>7</sup> baseline air quality has been obtained by collating data published by HDC and Defra. In addition, 'current' and future baseline concentrations of pollutants have been modelled at a number of locations following the methodology set out in Paragraphs 3.17 to 3.21.

#### **Construction Dust Impacts**

- 3.3 There is a potential for dust from onsite activities and off-site trackout during the construction period to have an impact on sensitive human and ecological receptors within the study area.
- 3.4 The suspension of dust and particulate matter is related to weather conditions and wind direction, ground and particle characteristics and on-site activities. There is a potential for impacts to occur when dust generating activities coincide with dry, windy conditions and where sensitive receptors are located downwind of the dust source.
- 3.5 Separation distance is an important factor as large particles (>30 µm) which are responsible for most dust annoyance largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m but are less likely to trigger annoyance. Significant annoyance is therefore generally limited to a few hundred metres of the source. Small particles (<10 µm) are deposited slowly and may travel up to 1 km. Whilst these particles are responsible for most impacts on human health, impacts are not likely to be experienced at significant distance due to dispersion effects.

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<sup>6</sup> The 'current' baseline year for the purposes of this assessment has been taken to be 2021 as this is the most recent year for which representative local monitoring data are available.

<sup>7</sup> The future baseline year has been taken to be 2025 as this is the earliest year that any part of the proposed development is anticipated to be occupied.

- 3.6 The assessment of construction dust effects has been carried out following the IAQM's 'Guidance on the Assessment of Dust from Construction and Demolition' (IAQM, 2014). Within the guidance, an 'impact' is described as a change in pollutant concentration or dust deposition and an 'effect' is described as the consequence of an impact.
- 3.7 The assessment considers three potential dust impacts:
- Loss of amenity due to dust soiling;
  - Human health effects due to an increase in concentrations of PM<sub>10</sub>; and
  - Harm caused to ecological receptors due to dust deposition.
- 3.8 Full details of the approach taken to assessing dust are provided in **Appendix B**. The stages of the assessment are:
- Identify whether there are sensitive receptors within the relevant distances (study area) for site activities during the construction phase;
  - Assess risk of dust impacts for each site activity type (demolition, earthworks, construction and trackout) – this includes identifying the emissions magnitude for each activity type, the sensitivity of the area and then combining these factors to identify risk;
  - Identify mitigation measures, based on assessed risk, sufficient to ensure off-site impacts are not significant; and
  - Assess impacts with mitigation in place. These should normally be not significant.
- 3.9 The IAQM guidance makes it clear that no assessment of the significance of effects without mitigation should be carried out as mitigation measures will be required due to planning conditions as well as best practice for construction companies. The IAQM guidance also states that the residual effect, taking into account the proposed mitigation will usually be 'not significant'.

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## **Construction Road Traffic Impacts**

### ***Human Health***

- 3.10 The potential impacts on existing sensitive properties as a result of construction traffic have been qualitatively assessed, taking into consideration the likely volumes of traffic, the anticipated duration of the construction period and any anticipated mitigation measures that are likely to be applied, have also been considered.
- 3.11 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

### ***Ecology***

- 3.12 The potential impacts on nearby designated ecological sites as a result of construction traffic have been qualitatively assessed, taking into consideration the likely volumes of construction traffic, the anticipated duration of the construction period and any anticipated mitigation measures that are likely to be applied.
- 3.13 Where it is not possible to screen out significant effects from road sources, detailed modelling and / or additional assessment in conjunction with an ecologist is then generally required.

## **Operational Road Traffic Impacts**

### ***Human Health***

#### ***Screening Assessment***

- 3.14 The EPUK/IAQM guidance 'Land Use Planning and Development Control: Planning for Air Quality' (EPUK & IAQM, 2017) includes a list of indicative criteria for where a detailed air quality assessment would be needed. The criteria relating to screening air quality impacts relating to additional traffic are:
- An increase in Light Duty Vehicle (LDV) traffic of >500 Annual Average Daily Traffic (AADT) (or >100 AADT within or adjacent to an AQMA); or
  - An increase in Heavy Duty Vehicle (HDV) traffic of >100 AADT (or >25 AADT within or adjacent to an AQMA).

- 3.15 The above criteria apply to any individual link and therefore, a development generating over 500 AADT (or >100 AADT within an AQMA) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.
- 3.16 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

#### *Detailed Assessment*

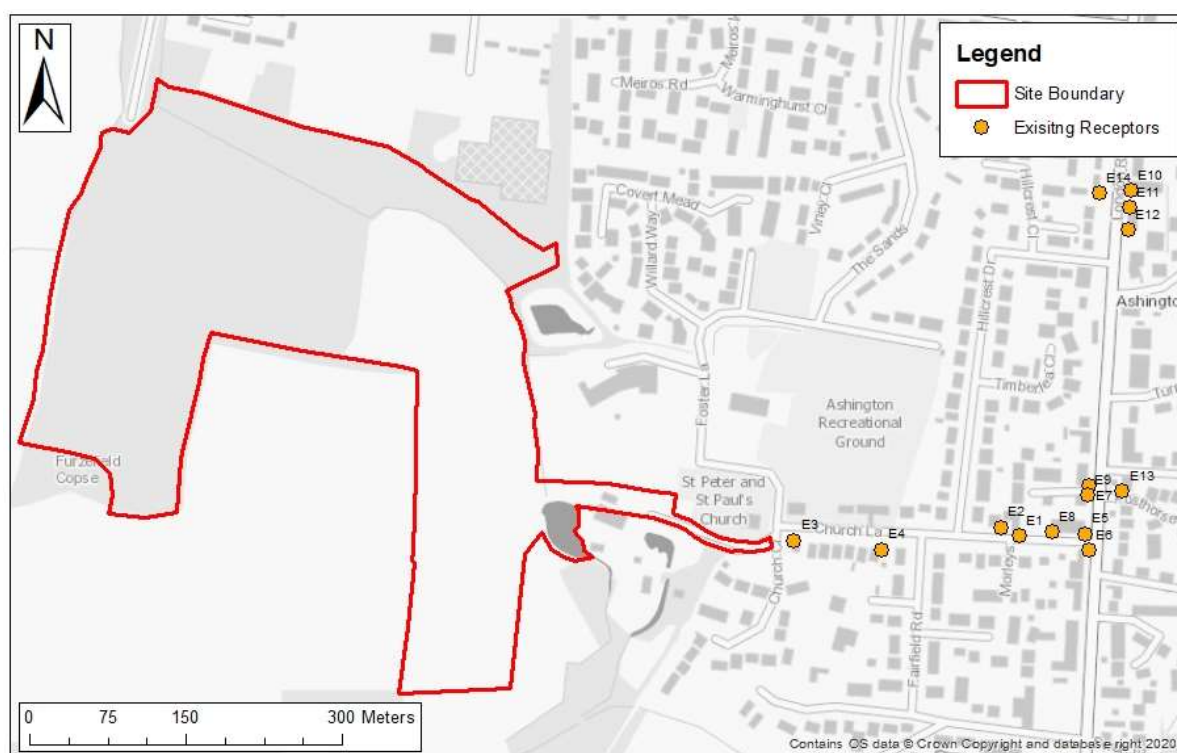
- 3.17 Annual mean concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> have been predicted at a range of worst-case existing locations for human health exposure. Concentrations and changes in concentrations have then been compared against appropriate assessment criteria in order to determine the significance of any effect.
- 3.18 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the relevant air quality objective(s). For pollutants of interest in this assessment (i.e. NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>), sensitive locations considered include the façades of residential properties and a nursery and pre-school, which are sensitive to the annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> objectives, the 24-hour mean PM<sub>10</sub> objective and the 1-hour mean NO<sub>2</sub> objective. When identifying worst-case locations, particular attention has been paid to locations close to junctions where the impact of more than one road link and/or slow, congested traffic may increase impacts, locations affected by multiple road links and locations in close proximity to roads where significant volumes of development-generated traffic are anticipated to travel.
- 3.19 Based on the criteria above, fourteen locations have been identified as worst-case existing receptors for assessment. These receptors have been chosen to represent locations where the impact of development-generated traffic are anticipated to be greatest. The locations of these receptors are shown in **Table 3-1** and **Figure 3-1**.
- 3.20 In addition, concentrations of NO<sub>2</sub> have been modelled at the local two diffusion tube monitoring sites for use in model verification. Further details of model verification are provided in **Appendix C**.

**Table 3-1: Existing Human Receptor Locations**

| Receptor | Description                                                  | Coordinates |        | Height (m) <sup>a</sup> | No. Properties Represented |
|----------|--------------------------------------------------------------|-------------|--------|-------------------------|----------------------------|
|          |                                                              | X           | Y      |                         |                            |
| E1       | Residential property adjacent to Church Lane                 | 513140      | 115874 | 1.5                     | 1                          |
| E2       | Residential property adjacent to Church Lane                 | 513122      | 115883 | 1.5                     | ~5                         |
| E3       | Residential property adjacent to Church Lane                 | 512924      | 115870 | 1.5                     | ~4                         |
| E4       | Residential property adjacent to Church Lane                 | 513008      | 115861 | 1.5                     | ~9                         |
| E5       | Residential property adjacent to Church Lane                 | 513203      | 115876 | 1.5                     | 1                          |
| E6       | Residential property adjacent to Church Lane                 | 513207      | 115860 | 1.5                     | 1                          |
| E7       | Residential property adjacent to London Road                 | 513207      | 115923 | 1.5                     | ~7                         |
| E8       | Residential property adjacent to Church Lane                 | 513171      | 115878 | 1.5                     | ~2                         |
| E9       | Residential property adjacent to London Road                 | 513206      | 115913 | 1.5                     | 1                          |
| E10      | Ashington Day Nursery and Preschool, adjacent to London Road | 513248      | 116206 | 0.5 <sup>b</sup>        | 1                          |
| E11      | Residential property adjacent to London Road                 | 513246      | 116189 | 1.5                     | ~2                         |
| E12      | Residential property adjacent to London Road                 | 513244      | 116168 | 1.5                     | ~3                         |
| E13      | Residential property adjacent to London Road                 | 513239      | 115918 | 1.5                     | ~7                         |
| E14      | Residential property adjacent to London Road                 | 513217      | 116203 | 1.5                     | ~17                        |

<sup>a</sup> Receptors have been modelled at heights of 1.5 m to represent ground floor level, unless specified otherwise.

<sup>b</sup> Receptor modelled at a height of 0.5 m to represent ground floor level for nursery and pre-school children.



**Figure 3-1: Existing Receptor Locations**

- 3.21 Concentrations of  $\text{NO}_2$ ,  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$  at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5.0.1). This model requires a number of inputs including traffic flow (AADT), composition (proportion of HDVs) and average speed as well as road characteristics such as width, gradient and street canyons as applicable.
- 3.22 Traffic data have been provided by the project's Transport Consultant (Motion) and obtained from the DfT database (DfT, 2022). Where necessary, this data has been adjusted to represent alternative years, where required, by utilising Trip End Model Presentation Program (TEMPro) growth factors (DfT, 2021), as provided by the project's Transport Consultant (Motion). A summary of the traffic data and the assumptions used in this assessment is provided in **Appendix D**.
- 3.23 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v11.1 (Defra, 2021c). This utilises emissions factors taken from the European Monitoring and Evaluation Programme (EMEP) / European Environment Agency (EEA) Air Pollution Emission Inventory Guidebook 2019 (EMEP / EEA, 2019) which is consistent with the COPERT 5.3 emission calculation tool (EMISIA, 2019), fleet composition data collected as part of the National Atmospheric Emissions Inventory (NAEI) and by Transport for London (TfL), along

with data relating to the fleet and vehicle turnover in the UK. Traffic data have been entered into the EFT to provide emissions rates for each of the road links modelled for the 'current'<sup>6</sup> and future<sup>7</sup> years, along with road type, vehicle fleet composition and speed. Whilst NO<sub>x</sub> emissions rates are related to exhaust only, emissions rates for PM<sub>10</sub> and PM<sub>2.5</sub> also include increments for road, tyre and break wear.

- 3.24 The model also requires meteorological data and inputs. The model has been run utilising 2021 data from the 'Charlwood' meteorological station which is considered to be suitable for the study area. **Appendix C** provides additional information on the meteorological inputs.

#### *Assumptions and Limitations*

- 3.25 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent on the traffic data that have been input which will have inherent uncertainties associated with them. There is then the uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 3.26 The modelled development traffic data has been based on the previous iteration provided by the project's Transport Consultants (Motion). However, the differences between the modelled and updated datasets are minor, and it is judged that these differences would not materially change the outcome of this assessment.
- 3.27 The model relies on meteorological data for 2021 which may not represent conditions in the future, particularly when taking into consideration additional uncertainties introduced as a result of climate change.
- 3.28 Per-vehicle exhaust emissions are predicted to reduce year-on-year due to technological advances and changes to the vehicle mix such as uptake of Euro VI/6 vehicles as well as Low and Ultra Low emission technology. Whilst there has been uncertainty regarding the accuracy of these predictions in the past, more recent evidence (Air Quality Consultants Ltd., 2020a) suggests that the current emissions factor predictions reflect real world conditions without the need for a sensitivity test. Additionally, the model has undergone a verification process in order to adjust the model to real-world conditions (i.e. local monitoring). It is, therefore,

considered appropriate to use emissions factors as provided by the EFT for this assessment without adjustment beyond appropriate verification.

- 3.29 As emissions are expected to reduce over time, it is considered a conservative approach to assess the impacts of the development in the earliest appropriate year. 2025 is the earliest year that any part of the development is likely to be operational and has, therefore, been chosen as the future assessment year. In order to ensure that potential future impacts are considered fully, volumes of development-generated traffic considered are based on the assumption that the development is fully occupied, in conjunction with emissions relating to 2025; this approach is considered to be appropriately conservative.
- 3.30 It should be noted that some of the traffic data used within this assessment and the emissions factors within the EFT are based on assumptions which were current before the occurrence of the Covid-19 pandemic. As such, these data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

#### *Air Quality Impacts Significance Criteria*

- 3.31 In the absence of official guidance in the UK on how to assess the significance of the air quality impacts of a new development, the approach developed by the IAQM and EPUK (EPUK & IAQM, 2017) has been followed in this assessment. This approach considers the predicted change in air quality, as a result of the development, on existing receptors, taking into account the absolute concentrations in comparison to the objectives (set out in **Table 2-1**). This guidance sets out three stages of assessment:
- 1) Determine the magnitude of change at each receptor as a percentage of the objective / Limit Value;
  - 2) Describe the impact at each receptor, taking into account the sensitivity of the receptor to changes in concentration (based on the average concentration in the assessment year); and
  - 3) Assess the overall significance.
- 3.32 The first two steps are set out **Table 3-2**.

**Table 3-2: Impact Descriptors for Individual Receptors <sup>a</sup>**

| Concentration <sup>b</sup> | % Change <sup>c</sup> |             |             |             |
|----------------------------|-----------------------|-------------|-------------|-------------|
|                            | 1 <sup>d</sup>        | 2-5         | 6-10        | >10         |
| ≤75% % <sup>e</sup>        | Negligible            | Negligible  | Slight      | Moderate    |
| >75% - ≤95% <sup>f</sup>   | Negligible            | Slight      | Moderate    | Moderate    |
| >95% - ≤102% <sup>g</sup>  | Slight                | Moderate    | Moderate    | Substantial |
| >102% - <110% <sup>h</sup> | Moderate              | Moderate    | Substantial | Substantial |
| ≥110% <sup>i</sup>         | Moderate              | Substantial | Substantial | Substantial |

<sup>a</sup> Where concentrations increase, the impact is described as adverse and where it decreases, it is described as beneficial.

<sup>b</sup> Long term average concentration at receptor in assessment year

<sup>c</sup> In relation to Objective / Limit Value

<sup>d</sup> % change rounded to nearest whole number. Where the change is 0 (i.e. <0.5) the impact will be Negligible.

<sup>e</sup> NO<sub>2</sub> or PM<sub>10</sub> annual mean ≤30µg/m<sup>3</sup>; PM<sub>2.5</sub> annual mean ≤18.75µg/m<sup>3</sup>; PM<sub>10</sub> daily mean ≤24µg/m<sup>3</sup> annual mean

<sup>f</sup> NO<sub>2</sub> or PM<sub>10</sub> annual mean >30-≤38µg/m<sup>3</sup>; PM<sub>2.5</sub> annual mean >18.75-≤23.75µg/m<sup>3</sup>; PM<sub>10</sub> daily mean >24-≤30.4µg/m<sup>3</sup> annual mean

<sup>g</sup> NO<sub>2</sub> or PM<sub>10</sub> annual mean >38-≤40.8µg/m<sup>3</sup>; PM<sub>2.5</sub> annual mean >23.75-≤25.5µg/m<sup>3</sup>; PM<sub>10</sub> daily mean >30.4-≤32.64µg/m<sup>3</sup> annual mean

<sup>h</sup> NO<sub>2</sub> or PM<sub>10</sub> annual mean >40.8-≤44µg/m<sup>3</sup>; PM<sub>2.5</sub> annual mean >25.5-≤27.5µg/m<sup>3</sup>; PM<sub>10</sub> daily mean >32.64-≤35.2µg/m<sup>3</sup> annual mean

<sup>i</sup> NO<sub>2</sub> or PM<sub>10</sub> annual mean >44µg/m<sup>3</sup>; PM<sub>2.5</sub> annual mean >27.5µg/m<sup>3</sup>; PM<sub>10</sub> daily mean >35.2µg/m<sup>3</sup> annual mean

3.33 The assessment of overall significance (step 3) is made based on professional judgement, taking into account factors such as:

- The number of properties affected by different levels of impacts;
- The magnitude of any changes and descriptors (as identified in stages 1 and 2);
- Whether a new exceedance of an objective or limit value is predicted to arise or an existing exceedance is removed, or an existing exceedance is substantially increased or reduced;
- The level of uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.34 When considered at individual receptors, moderate or substantial impacts at individual receptors may be considered significant, and negligible or slight impacts not significant. Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole including the extent to which

receptors represent sensitive locations and whether this wider impact is significant or not.

### **Ecology**

- 3.35 Based on the IAQM guidance (IAQM, 2020) there is a potential for 'significant' effects on ecology as a result of transport emissions in cases where sensitive designated ecological sites are located within 200 m of an affected road where a development alone, or in combination with other committed developments, will increase traffic flows by >1,000 total AADT and / or >200 HDV AADT.
- 3.36 Where it is not possible to screen out significant effects from road sources, detailed modelling and / or additional assessment in conjunction with an ecologist is then generally required.

### **Site Suitability**

- 3.37 The potential for exceedances of the relevant objectives at sensitive locations within the proposed development has been screened qualitatively, taking into consideration the location of the Site in relation to nearby emission sources (e.g. local roads), the layout of the proposed development and baseline air quality conditions within the Site and in the surrounding area.
- 3.38 Where it is not possible to screen out the potential for significant effects, detailed assessment is then generally required.

### **Damage Cost Calculations**

- 3.39 The damage costs associated with operational traffic generated by the proposed development have been calculated following the approach outlined by Defra's damage cost guidance (Defra, 2021a) and the 'Air Quality and Emissions Mitigation Guidance for Sussex' (Sussex-air Air Quality Partnership, 2021). This approach involves using Defra's EFT (Defra, 2021c) to predict the amount of pollution (NO<sub>x</sub> and PM<sub>2.5</sub>) that development-generated traffic will produce over a five-year period. Calculated NO<sub>x</sub> and PM<sub>2.5</sub> emissions have then been multiplied by the damage cost values provided by Defra (using the 'Damage Costs Appraisal Toolkit' (Defra, 2021b)) to provide the total attributable development damage costs.

## **4.0 BASELINE CONDITIONS**

### **Site Context and Study Area**

- 4.1 The site is bounded by woodland to the north, woodland and a nursery and primary school to the east, and woodland and agricultural land to the south and west. The surrounding area is predominantly agricultural and residential.
- 4.2 There are several designated ecological sites located in close proximity to the Site, including 'Spring Copse' Ancient Woodland (AW) located approximately 220 m to the south and 'America Wood' AW located approximately 750 m to the east.
- 4.3 The study area in relation to air quality has been defined as:
- For the construction dust risk assessment, the study area is the area up to 350 m from the development site boundary and up to 50 m of the route(s) used by construction vehicles on the public highway (up to 500 m from the site exit(s));
  - For the assessment of the effect of development-generated traffic on human health, the study area incorporates all main roads (and adjacent sensitive human receptors) along which vehicles generated by the proposed development may travel;
  - For the assessment of the effect of development-generated traffic on ecology, the study area incorporates all main roads located within 200 m of a designated ecological site along which vehicles may travel, as well as parts of the designated ecological site located within 200 m of the road; and
  - For the assessment of Site suitability, the study area has been identified as the area within the boundary of the Site and sources which will influence this area.

### **EU Limit Values**

- 4.4 The Site is located approximately 4 km to the northeast of the Storrington AURN roadside monitoring site. This site measured an annual mean NO<sub>2</sub> concentration of 20 µg/m<sup>3</sup> in 2021, meeting the EU Limit Value.

- 4.5 Defra's PCM model (Defra, 2020a) does not predict any exceedances of the NO<sub>2</sub> annual mean EU Limit Value on roads in close proximity to the Site in 2019. No exceedances of the PM<sub>10</sub> and PM<sub>2.5</sub> EU Limit Values were predicted on roads in close proximity to the Site in 2020 and 2025<sup>8</sup>.

### LAQM

- 4.6 HDC has assessed air quality within its area as part of its responsibilities under LAQM. Two AQMAs have been declared within the district, these being:
- 'Horsham AQMA No. 1' an area encompassing the 'West Street, the High Street, and part of School Hill and Manleys Hill, Storrington'; and
  - 'Horsham Cowfold AQMA' – an area 'incorporating The Street, part of Station Road and Bolney Road.
- 4.7 Both of these AQMAs were declared for exceedances in the annual mean NO<sub>2</sub> objective. The Site is located within neither of the AQMAs.

### Monitoring

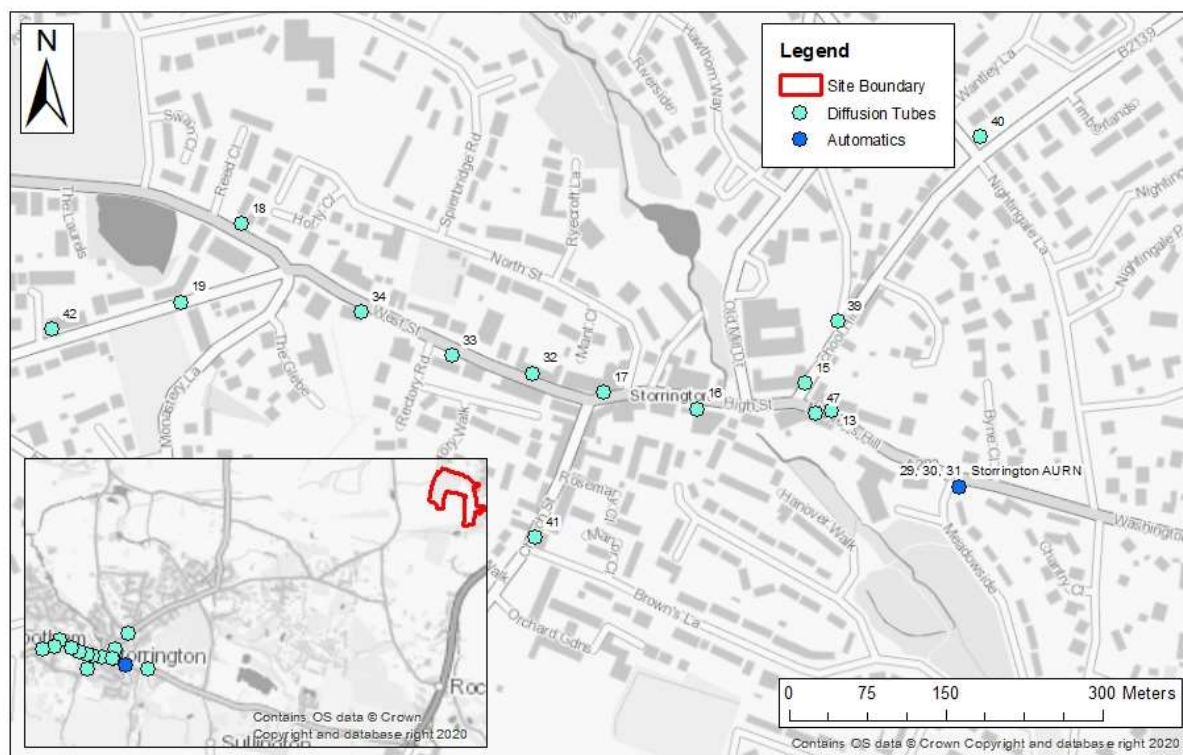
- 4.8 HDC carried out NO<sub>2</sub> monitoring at both automatic and non-automatic diffusion tube monitoring sites in 2021. The most representative locations are identified in **Figure 4-1** and measured concentrations from 2017 to 2021<sup>9</sup> are shown in **Table 4-1** and **Table 4-2**.
- 4.9 Exceedances of the NO<sub>2</sub> annual mean objective were measured at diffusion tube monitoring site 47 in 2017, 2018 and 2019, and at diffusion tube monitoring sites 13 in 2017 and 2018. No exceedances of the annual mean objective were measured in 2021.

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<sup>8</sup> 2021 data are not available for PM, and so data for 2020 and 2025 have been considered instead.

<sup>9</sup> As a result of the Covid-19 pandemic and associated behavioural changes and measures implemented by the governing authorities (e.g. lockdowns, travel restrictions etc.) measured concentrations during 2020 are not considered to be representative of 'normal' conditions. As such, measured 2020 concentrations are presented for information only, and have not been discussed or given weight in determining the conclusions of this assessment.

- 4.10 Automatic monitoring site HO4 did not measure any exceedances of the 1-hour mean objective between 2017 and 2021. Furthermore, concentrations at all reported monitoring sites did not exceed  $60 \mu\text{g}/\text{m}^3$  between 2017 and 2021, suggesting that exceedances of the 1-hour mean objective were not likely during this period at these monitoring sites.
- 4.11 Overall, a trend of decreasing measured  $\text{NO}_2$  concentrations is apparent at automatic monitoring site HO4 - Storrington AURN and at the Storrington diffusion tube monitoring sites from 2017 to 2021.



**Figure 4-1: Local Monitoring Locations**

Table 4-1: Measured Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>)

| Site ID                     | Site Name                 | Site Type        | 2017      | 2018      | 2019      | 2020 | 2021 |
|-----------------------------|---------------------------|------------------|-----------|-----------|-----------|------|------|
| <b>Automatic Sites</b>      |                           |                  |           |           |           |      |      |
| HO4                         | Storrington AURN          | Roadside         | 23        | 23        | 22        | 17   | 20   |
| <b>Diffusion Tube Sites</b> |                           |                  |           |           |           |      |      |
| 13                          | Storrington 1             | Roadside         | <b>41</b> | <b>45</b> | 39        | 32   | 34   |
| 15                          | Storrington 3             | Roadside         | 32        | 33        | 28        | 23   | 25   |
| 16                          | Storrington 4             | Roadside         | 38        | 36        | 30        | 26   | 26   |
| 17                          | Storrington 5             | Roadside         | 27        | 26        | 23        | 19   | 20   |
| 18                          | Storrington 6             | Roadside         | 24        | 22        | 19        | 15   | 17   |
| 19                          | Storrington 7             | Roadside         | 22        | 21        | 18        | 16   | 18   |
| 29, 30, 31                  | Storrington 8, 9, 10 AURN | Roadside         | 26        | 27        | 23        | 21   | 22   |
| 32                          | Storrington 13n           | Roadside         | 31        | 30        | 26        | 21   | 23   |
| 33                          | Storrington 12n           | Roadside         | 29        | 29        | 26        | 20   | 23   |
| 34                          | Storrington 11n           | Roadside         | 38        | 38        | 30        | 25   | 27   |
| 39                          | Storrington 16n           | Roadside         | 24        | 24        | 22        | 19   | 19   |
| 40                          | Storrington 15n           | Roadside         | 20        | 19        | 17        | 15   | 15   |
| 41                          | Storrington 17n           | Urban Background | 13        | 13        | 11        | 10   | 10   |
| 42                          | Storrington 18n           | Roadside         | 20        | 19        | 16        | 13   | 18   |
| 47                          | Storrington 19n           | Roadside         | <b>56</b> | <b>51</b> | <b>48</b> | 38   | 40   |
| <b>Objective</b>            |                           |                  | <b>40</b> |           |           |      |      |

Exceedances of the annual mean objective are shown in **BOLD**.

Data taken from HDC Air Quality Annual Status Report (ASR) (HDC, 2022).

\*No data available

**Table 4-2: Measured Incidences of Hourly Mean NO<sub>2</sub> Concentrations  
>200 µg/m<sup>3</sup>**

| Site ID          | Site Name        | Site Type | Number of Hours >200 µg/m <sup>3</sup> |      |      |      |      |
|------------------|------------------|-----------|----------------------------------------|------|------|------|------|
|                  |                  |           | 2017                                   | 2018 | 2019 | 2020 | 2021 |
| HO4              | Storrington AURN | Roadside  | 0                                      | 0    | 0    | 0    | 0    |
| <b>Objective</b> |                  |           | <b>18</b>                              |      |      |      |      |

Data taken from HDC Air Quality ASR (HDC, 2022).

- 4.12 HDC did not undertake any monitoring of either PM<sub>10</sub> or PM<sub>2.5</sub> in close proximity to the development Site in 2021.

### Predicted Background Concentrations

- 4.13 Predicted annual mean background concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> have been obtained from national maps provided by Defra (Defra, 2020b). The predicted backgrounds are shown in **Table 4-3**.
- 4.14 The predicted background concentrations are all well below the relevant objectives within the Site and at identified existing receptors.

**Table 4-3: Predicted Annual Mean Background Concentrations (µg/m<sup>3</sup>)**

| Year              | Location                        | NO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> |
|-------------------|---------------------------------|-----------------|------------------|-------------------|
| 2021              | Receptors E10, E11, E12 & E14   | 10              | 14               | 9                 |
|                   | Receptors E1, E2, E4 – E9 & E13 | 9               | 13               | 9                 |
|                   | Site (north) & Receptor E3      | 9               | 14               | 9                 |
|                   | Site (south)                    | 8               | 14               | 9                 |
| 2025              | Receptors E10, E11, E12 & E14   | 9               | 13               | 8                 |
|                   | Receptors E1, E2, E4 – E9 & E13 | 8               | 13               | 8                 |
|                   | Site (north) & Receptor E3      | 7               | 13               | 8                 |
|                   | Site (south)                    | 7               | 13               | 8                 |
| <b>Objectives</b> |                                 | <b>40</b>       | <b>40</b>        | <b>20</b>         |

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

### Predicted Baseline Concentrations

- 4.15 The ADMS-Roads model has been used to predict baseline annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at each of the existing receptor locations identified in **Figure 3-1** for both the 'current'<sup>6</sup> and future<sup>7</sup> baseline scenarios. The results of these predictions are shown in **Table 4-4**.

- 4.16 The predicted annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are well below the relevant objectives in both 2021 and 2025. Furthermore, predicted annual mean concentrations of NO<sub>2</sub> and PM<sub>10</sub> are below 60 µg/m<sup>3</sup> and 32 µg/m<sup>3</sup> respectively, indicating that exceedances of the short-term objectives are not likely.

**Table 4-4: Predicted Annual Mean Baseline Concentrations (µg/m<sup>3</sup>)**

| Receptor          | NO <sub>2</sub> |      | PM <sub>10</sub> |      | PM <sub>2.5</sub> |      |
|-------------------|-----------------|------|------------------|------|-------------------|------|
|                   | 2021            | 2025 | 2021             | 2025 | 2021              | 2025 |
| E1                | 12              | 10   | 14               | 13   | 9                 | 8    |
| E2                | 11              | 9    | 13               | 13   | 9                 | 8    |
| E3                | 10              | 8    | 13               | 13   | 9                 | 8    |
| E4                | 11              | 9    | 13               | 13   | 9                 | 8    |
| E5                | 14              | 11   | 14               | 13   | 9                 | 9    |
| E6                | 17              | 14   | 15               | 14   | 9                 | 9    |
| E7                | 14              | 11   | 14               | 13   | 9                 | 9    |
| E8                | 11              | 9    | 13               | 13   | 9                 | 8    |
| E9                | 14              | 11   | 14               | 13   | 9                 | 9    |
| E10               | 15              | 12   | 14               | 13   | 9                 | 9    |
| E11               | 15              | 12   | 14               | 13   | 9                 | 9    |
| E12               | 15              | 12   | 14               | 13   | 9                 | 9    |
| E13               | 12              | 10   | 14               | 13   | 9                 | 8    |
| E14               | 13              | 11   | 14               | 13   | 9                 | 8    |
| <b>Objectives</b> | <b>40</b>       |      | <b>40</b>        |      | <b>20</b>         |      |

Exceedances of the objectives are shown in **BOLD**.

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

## 5.0 PREDICTED IMPACTS

### Construction Dust Impacts

#### *Screening Assessment*

- 5.1 The primary potential effects during the construction phase relate to annoyance and loss of amenity caused by dust soiling, health impacts relating to PM<sub>10</sub> and ecological impacts due to dust deposition. Based on the screening criteria set out by the IAQM, it is considered necessary to carry out a construction dust risk assessment as there are sensitive human receptors located within 350 m of the Site boundary and within 50 m of the roads along which dust may be tracked out by construction vehicles.
- 5.2 There are no designated ecological sites located within 50 m of the Site boundary or roads along which dust may be tracked and, therefore, the assessment of dust deposition on ecological sites can be scoped out.

#### *Further Assessment*

##### *Dust Emission Magnitude*

- 5.3 The dust emission magnitude relating to demolition, earthworks and construction activities and as a result of trackout have been determined based on the IAQM guidance (as set out in **Appendix B**).
- 5.4 There are no notable structures that will require demolition. As such, the potential risk of impacts associated with demolition activities can be scoped out, and is not considered further.
- 5.5 Proposed earthworks activities include the excavation for foundations of the proposed development. Works could extend up to approximately 80,000 m<sup>2</sup> (the approximate area of the Site). The soil composition at the Site is deep with a medium-light to heavy silty texture and a clay/mudstone and colluvium subsoil with grains of argillaceous<sup>10</sup> to arenaceous<sup>11</sup> size (UK Soil Observatory, 2022), and is, therefore, considered to have the potential to be moderately dusty. As such,

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<sup>10</sup> Typical particle size of <0.06 mm.

<sup>11</sup> Typical particle size of between 0.06 to 2.0 mm.

the dust emission magnitude associated with earthworks activities is considered to be 'large'.

- 5.6 The development will incorporate construction of 180 residential units, including two residential blocks and private housing. The combined total building volume is estimated to be >100,000 m<sup>3</sup> in total. As such, the dust emission magnitude associated with construction activities is considered to be 'large'.
- 5.7 The number of vehicles exiting the Site which may track material onto roads is unknown, however, given the size and nature of the development, peak movements are expected to be >50 HDVs per day. As such, the dust emission magnitude associated with trackout activities is considered to be 'large'.

#### *Area Sensitivity*

- 5.8 The sensitivity of the area to dust soiling and human health impacts has been assessed based on the criteria shown in **Appendix B**.
- 5.9 Residential properties and schools are considered to be of 'high' sensitivity to dust soiling impacts. There are no receptors located within 20 m of the Site, and estimated to be >100 'high' sensitivity receptors (Ashington C of E First School<sup>12</sup>) located within 50 m of the Site boundary. The sensitivity of the area surrounding the Site to dust soiling impacts is, therefore, considered to be 'high'.
- 5.10 The guidance states that trackout can occur on roads up to 500 m from large size sites. As construction vehicle routing are not currently known, the worst-case assumption has been made that all main roads may be used by HDVs exiting the Site, and that dust and mud may be tracked up to 500 m along these roads from the Site exit(s). There are between 10 and 100 residential properties located within 20 m of roads which may be subject to trackout and the sensitivity to dust soiling impacts relating to trackout is, therefore, considered to be 'high'.
- 5.11 Residential properties and schools are also considered to be 'high' sensitivity receptors in terms of human health impacts. For the purposes of the construction dust risk assessment, the assumption has been made that annual mean concentrations of PM<sub>10</sub> within the study area are comparable to maximum

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<sup>12</sup> Each pupil and member of staff that attends Ashington C of E First School has been counted as an individual receptor; this is considered to be an appropriately worst-case assumption.

predicted baseline levels in the 'current'<sup>6</sup> year at existing receptors E1 – E4 and E8 (i.e. 14 µg/m<sup>3</sup>, as shown in **Table 4-3**). Taking into account the assumed baseline PM<sub>10</sub> concentrations and the number of sensitive receptors located in close proximity to of the Site boundary (see Paragraph 5.9) and the roads where trackout may occur (see in Paragraph 5.10), the sensitivity of the surrounding area to human health impacts is, therefore, considered to be 'low' for both on-site activities and trackout.

#### *Risk of Impacts*

- 5.12 The risk of construction dust impacts, without mitigation, has been assessed based on the tables provided in **Appendix B** and the identified risks are shown in **Table 5-1**.

**Table 5-1: Risk of Construction Dust Impacts Without Mitigation**

| Potential Impact | Risk       |              |          |
|------------------|------------|--------------|----------|
|                  | Earthworks | Construction | Trackout |
| Dust Soiling     | High       | High         | High     |
| Human Health     | Low        | Low          | Low      |

- 5.13 Overall, taking into consideration the risks set out in **Table 5-1**, appropriate mitigation measures corresponding to a 'high' risk site are required. The recommended list of mitigation measures is set out in **Section 6.0**.
- 5.14 The IAQM recommends that no judgement of the significance of construction dust effects should be made without taking mitigation into account. This is due to the fact that mitigation measures are assumed to be secured by planning conditions and legal requirements as well and construction codes of conduct. Following implementation of the recommended mitigation (as set out in **Section 6.0**), residual impacts will be 'not significant'.

### **Construction Road Traffic Impacts**

#### ***Human Health***

- 5.15 The volume of construction traffic generated by the proposed development is not available, however, there is likely to be significant fluctuation in the numbers of vehicle movements associated with proposed development throughout the

construction period. When these vehicle movements are averaged over a year, they will be significantly lower than peak movements.

- 5.16 Volumes of construction traffic generated by the proposed development are anticipated to be lower than volumes of development-generated operational traffic, as this is typically the case for developments of this size and type. This being the case, it is reasonable to expect that impacts associated with emissions from construction vehicles will be less adverse than those described in Paragraphs 5.24 to 5.28.
- 5.17 It should also be taken into consideration that any impacts associated with the construction phase will be temporary in nature, with the construction phase anticipated to have a maximum duration of 5 years. Furthermore, it is anticipated that a Construction Environmental Management Plan (CEMP) will be developed and will include measures to minimise emissions associated with construction vehicles, thus further reducing any potential impacts.
- 5.18 On the basis of the above, it is considered to be likely that the overall effect of development-generation construction traffic on nearby sensitive existing properties will be 'not significant'.

### ***Ecology***

- 5.19 Specific details regarding the volume and routing of construction traffic generated by the proposed development are not available, however, the average vehicle movements during the construction phase are likely to be significantly lower than peak movements. The volume and routing of construction traffic associated with any committed developments in the local area is also not known.
- 5.20 It should also be noted that the construction phase will be temporary (with an anticipated duration of approximately 5 years) and it is anticipated that emissions will be controlled through the implementation of a CEMP.
- 5.21 On the basis of the above, it is considered to be likely that the overall effect of development-generation construction traffic on nearby sensitive designated ecological sites will be 'not significant'.

## Operational Road Traffic Impacts

### Human Health

#### Screening Assessment

- 5.22 The proposed development will generate additional traffic during the operational phase which will result in an increase of over 500 AADT on Church Close, Church Lane, and London Road. It is, therefore, not possible to screen out the potential for significant impacts on these stretches of road based on the IAQM/EPUK screening criteria. As such, a more detailed assessment has been carried out.

#### Detailed Assessment

- 5.23 Annual mean concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> have been predicted at existing receptors in 2025, both with and without the proposed development in place. The identified receptors are described in **Table 3-1** and shown in **Figure 3-1**. Predicted concentrations, the proportional change and the impact at each receptor are presented in **Table 5-2**, **Table 5-3** and **Table 5-4** for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>, respectively.

**Table 5-2: Predicted Annual Mean Concentrations of NO<sub>2</sub> (µg/m<sup>3</sup>), % Change and Impact at each Existing Receptor**

| Receptor         | 2025 Without Development | 2025 With Development | Change (%) | Impact     |
|------------------|--------------------------|-----------------------|------------|------------|
| E1               | 10                       | 11                    | 4          | Negligible |
| E2               | 9                        | 10                    | 2          | Negligible |
| E3               | 8                        | 9                     | 2          | Negligible |
| E4               | 9                        | 10                    | 2          | Negligible |
| E5               | 11                       | 13                    | 3          | Negligible |
| E6               | 14                       | 15                    | 4          | Negligible |
| E7               | 11                       | 11                    | 1          | Negligible |
| E8               | 9                        | 10                    | 2          | Negligible |
| E9               | 11                       | 11                    | 1          | Negligible |
| E10              | 12                       | 12                    | 1          | Negligible |
| E11              | 12                       | 12                    | 1          | Negligible |
| E12              | 12                       | 12                    | 1          | Negligible |
| E13              | 10                       | 10                    | 1          | Negligible |
| E14              | 11                       | 11                    | 1          | Negligible |
| <b>Objective</b> | <b>40</b>                |                       | <b>-</b>   |            |

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources.

**Table 5-3: Predicted Annual Mean Concentrations of PM<sub>10</sub> (µg/m<sup>3</sup>), %  
Change and Impact at each Existing Receptor**

| Receptor         | 2025 Without Development | 2025 With Development | Change (%) | Impact     |
|------------------|--------------------------|-----------------------|------------|------------|
| E1               | 13                       | 13                    | 1          | Negligible |
| E2               | 13                       | 13                    | 0          | Negligible |
| E3               | 13                       | 13                    | 0          | Negligible |
| E4               | 13                       | 13                    | 0          | Negligible |
| E5               | 13                       | 14                    | 1          | Negligible |
| E6               | 14                       | 14                    | 1          | Negligible |
| E7               | 13                       | 13                    | 0          | Negligible |
| E8               | 13                       | 13                    | 0          | Negligible |
| E9               | 13                       | 13                    | 0          | Negligible |
| E10              | 13                       | 13                    | 0          | Negligible |
| E11              | 13                       | 13                    | 0          | Negligible |
| E12              | 13                       | 13                    | 0          | Negligible |
| E13              | 13                       | 13                    | 0          | Negligible |
| E14              | 13                       | 13                    | 0          | Negligible |
| <b>Objective</b> | <b>40</b>                |                       | <b>-</b>   |            |

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources.

**Table 5-4: Predicted Annual Mean Concentrations of PM<sub>2.5</sub> (µg/m<sup>3</sup>), %  
Change and Impact at each Existing Receptor**

| Receptor         | 2025 Without Development | 2025 With Development | Change (%) | Impact     |
|------------------|--------------------------|-----------------------|------------|------------|
| E1               | 8                        | 9                     | 1          | Negligible |
| E2               | 8                        | 8                     | 1          | Negligible |
| E3               | 8                        | 8                     | 0          | Negligible |
| E4               | 8                        | 8                     | 0          | Negligible |
| E5               | 9                        | 9                     | 1          | Negligible |
| E6               | 9                        | 9                     | 1          | Negligible |
| E7               | 9                        | 9                     | 0          | Negligible |
| E8               | 8                        | 8                     | 0          | Negligible |
| E9               | 9                        | 9                     | 0          | Negligible |
| E10              | 9                        | 9                     | 0          | Negligible |
| E11              | 9                        | 9                     | 0          | Negligible |
| E12              | 9                        | 9                     | 0          | Negligible |
| E13              | 8                        | 8                     | 0          | Negligible |
| E14              | 8                        | 8                     | 0          | Negligible |
| <b>Objective</b> | <b>40</b>                |                       | <b>-</b>   |            |

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources.

5.24 The predicted annual mean NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in 2025, both without and with the proposed development in place, are well below the relevant

objectives at all existing receptor locations. Furthermore, predicted annual mean concentrations of NO<sub>2</sub> and PM<sub>10</sub> are below 60 µg/m<sup>3</sup> and 32 µg/m<sup>3</sup> respectively, indicating that exceedances of the short-term objectives for NO<sub>2</sub> and PM<sub>10</sub> are not likely.

- 5.25 The predicted changes in annual mean NO<sub>2</sub> concentrations (when rounded to the nearest whole number) are 1% at 7 receptors, 2% at 4 receptors, 3% at 1 receptor and 4% at 2 receptors. Using the criteria set out in **Table 3-2**, these impacts are described as being 'negligible' at all receptors based on the significance criteria.
- 5.26 The predicted changes in PM<sub>10</sub> and PM<sub>2.5</sub> concentrations (when rounded to the nearest whole number) are 0 or 1% at all receptors; as such, PM<sub>10</sub> and PM<sub>2.5</sub> impacts are considered to be 'negligible' at all receptors.
- 5.27 The overall effect on existing receptors has been considered, taking into account the following factors:
- the impacts at individual modelled receptors;
  - the number of properties represented by each modelled receptor;
  - the assumptions and limitations of the model, including any conservative / worst-case assumptions;
  - the predicted concentrations and how close these are to the relevant objectives; and
  - the potential for any change to impact on an existing AQMA and / or to result in the declaration or extension of an AQMA.

- 5.28 Taking these factors into account, the overall impact of the proposed development on local air quality is considered to be 'not significant'.

### ***Ecology***

- 5.29 The project's Transport Consultants (Motion) have indicated that there are no known committed developments which would result in an increase of >1,000 AADT on local roads, when combined with the traffic generated by the proposed development. As such, the combined traffic generation is anticipated to be below the screening criteria outlined in Paragraph 3.35 and, therefore, the overall effect

of operational traffic on nearby designated ecological receptors can be screened out as being 'not significant'.

### Site Suitability

- 5.30 The proposed development will introduce new areas of sensitive exposure which are sensitive to the long-term and short-term NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> objectives (i.e. the proposed residences).
- 5.31 There are no main roads located in close proximity to the Site, which it is located close to minor roads only. Furthermore, proposed residences are set back from nearby minor roads. As such, pollutant concentrations within the Site are anticipated to be comparable to background conditions, which are predicted to be well below the annual mean objectives in the future<sup>7</sup> year (see **Table 4-3**).
- 5.32 Taking into consideration the above, it is judged that new residents of the proposed development will experience good air quality and that, therefore, the Site is suitable for its intended end-use.

### Damage Cost Calculations

- 5.33 Damage costs associated with operational traffic anticipated to be generated by the proposed development have been calculated.
- 5.34 Annual emissions of NO<sub>x</sub> and PM<sub>2.5</sub> have been calculated using Defra's EFT (Defra, 2021c). EFT inputs are presented in **Table 5-5** for the five-year period<sup>13</sup> 2027 (i.e. the year of completion of the proposed development) to 2031.
- 5.35 Damage costs for the period 2027 – 2031, calculated using Defra's 'Damage Costs Appraisal Toolkit' (Defra, 2021b), are presented in **Table 5-6**.

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<sup>13</sup> The Sussex-air guidance (Sussex-air Air Quality Partnership, 2021) suggests accounting for a five-year period by simply multiplying calculated annual emissions associated with a development by 5. However, for the purposes of this assessment, annual emissions have been calculated for four separate years (2027, 2028, 2029 and 2030) using Defra's EFT. Annual emissions calculated for 2030 have been used to represent 2031, as the EFT does not provide emissions factors for use in AQAs beyond 2030. This approach is considered to provide a more representative indication of the emissions that will be associated with the proposed development from 2027-2031.

**Table 5-5: Damage Cost Calculations; EFT Inputs per Year**

| Area                 | Traffic Flow       | %HDV           | Speed (kph)     | Link Length (km) |
|----------------------|--------------------|----------------|-----------------|------------------|
| England (not London) | 1,135 <sup>a</sup> | 0 <sup>a</sup> | 50 <sup>b</sup> | 10 <sup>b</sup>  |

<sup>a</sup> Operational traffic generated by the proposed development, as provided by the project's Transport Consultant (Motion).

<sup>b</sup> Based on the assumptions specified by the Sussex-air guidance (Sussex-air Air Quality Partnership, 2021).

**Table 5-6: Calculated Damage Costs (Central Present Value) (2027 - 2031) <sup>a</sup>**

| Pollutant                      | Value (£)     |
|--------------------------------|---------------|
| NO <sub>x</sub> <sup>a</sup>   | 10,194        |
| PM <sub>2.5</sub> <sup>a</sup> | 10,855        |
| <b>Total</b>                   | <b>21,050</b> |

<sup>a</sup> Determined using a Base Price Year of 2022.

<sup>a</sup> Pollutant source defined as 'Road Transport Rural'.

## 6.0 MITIGATION

### **Sussex-air Air Quality Partnership Guidance; Standard Mitigation Measures**

6.1 The 'Air Quality and Emissions Mitigation Guidance for Sussex (2021)' (Sussex-air Air Quality Partnership, 2021) requires that the following standard mitigation should be applied for all major residential developments (i.e. including the proposed development):

- All gas-fired boilers to meet a minimum standard of <40 mg NO<sub>x</sub>/kWh. Consideration should be given to renewable sources of energy, e.g. ASHPs, as an alternative;
- Meet the electric vehicle charging point guidance set out by the governing authority; West Sussex<sup>14</sup>; and
- Regarding construction, the guidance requires mitigation in accordance with the IAQM's 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014); this has been set out below.

### **Construction Dust**

6.2 The following standard mitigation measures have been identified as being appropriate for a 'high' risk site (see **Table 5-1**). This is based on the recommendations within the IAQM's 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014).

6.3 A Dust Management Plan (DMP) should be submitted to HDC prior to works commencing on site.

### **Communications**

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;

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<sup>14</sup> The Sussex-air guidance references the 'Guidance on Parking at New Developments' (WSCC, 2020) and the WSCC website (WSCC, 2022).

- 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; and
- Display the head or regional office contact information.

### ***Dust Management***

- Develop and implement a DMP, which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, realtime PM<sub>10</sub> 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 exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book; and
- Hold regular liaison meetings with other high risk construction sites within 500 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 windowsills within 100 m of site boundary, with cleaning to be provided if necessary;

- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked;
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and
- Agree dust deposition, dust flux, or real-time PM<sub>10</sub> continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

### ***Preparing and maintaining the site***

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- 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; and
- 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 any surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate;
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Implement a Travel Plan that supports and encourages sustainable 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 such equipment wherever appropriate; and
- 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.

### ***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; and
- Only remove the cover in small areas during work and not all at once.

### ***Construction***

- Avoid scabbling (roughening of concrete surfaces) 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; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

### ***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 any on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;

- Record all inspections of any haul routes and any subsequent action in a site log book;
- Any haul routes installed shall be hard surfaced and 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 to 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; and
- Access gate to be located at least 10 m from receptors where possible.

### **Construction Traffic**

- 6.4 The overall effects, without mitigation, of construction traffic generated by the proposed development on sensitive human and ecological locations in the study area are likely to be 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

### **Operational Traffic**

- 6.5 The overall effects, without mitigation, of operational traffic generated by the proposed development on sensitive human and ecological locations in the study area will be 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

### **Site Suitability**

- 6.6 Air quality for future residents is considered to be good and the Site is suitable for its proposed end-use. As such, no additional mitigation is considered to be necessary.

### **Damage Costs**

- 6.7 In addition to the standard measures required (as outlined above), the Sussex-air guidance requires that the costs equivalent to at least the calculated damage cost

value (see **Table 5-6**) shall be spent on mitigation measures. A list of possible mitigation measures to be considered for residential developments is as follows:

- Invest in EV charging infrastructure (minimum 7kW (fast) charger) within the development over and above the current recommended parking standards;
- Provide vouchers for alternatives to private car use;
- Provide public transport subsidy for residents;
- Set up a car club within the development or contribute to the cost of a local car club;
- Set up or join an existing car sharing scheme for residents;
- Designate parking spaces for car club/car sharing vehicles;
- Designate parking spaces for low emission vehicles;
- Provide electric bikes;
- Improve cycle paths to link to the existing local cycle network;
- Provide secure cycle storage;
- Invest in additional evergreen infrastructure to reduce particulates and other pollutants;
- Contribute to local low or zero emission vehicle refuelling/recharging infrastructure;
- Contribute to low emission bus service provision or waste collection services;
- Contribute to local bike/e-bike hire schemes;
- Contribute to renewable fuel and energy generation projects; and
- Fund incentives for the take-up of low emission technologies and fuels.

6.8 Furthermore, the guidance also requires that the mitigation options selected should be relevant and appropriate to the following:

- local policies;
- the local authority's AQAP, if applicable; and
- the type, size and location of the development.

6.9 The selected mitigation measures shall be submitted to and approved by HDC.

## **7.0 CONCLUSIONS**

- 7.1 The potential air quality impacts associated with the proposed residential development on Church Lane have been assessed.
- 7.2 There is the potential for dust and PM<sub>10</sub> impacts during the construction phase. However, with the proposed mitigation measures in place, these impacts will be 'not significant'.
- 7.3 The traffic generation associated with the development during the construction phase is unknown, however, any impacts will be temporary and are expected to be mitigated to some extent by the implementation of a CEMP. As such, the overall effect of construction traffic on sensitive receptors is likely to be 'not significant'.
- 7.4 The traffic generation associated with the proposed development during the operational phase, in combination with traffic generated by nearby committed developments, is anticipated to fall below the relevant screening criteria for ecological impacts at nearby designated ecological sites. As such, the overall effect of operational traffic on sensitive designated ecological receptors is screened out as being 'not significant'.
- 7.5 The impact of emissions associated with operational traffic generated by the proposed development on local air quality has been considered, with modelling of pollutant concentrations having been undertaken at nearby worst-case existing sensitive properties. Predicted changes in pollutant concentrations will be 'negligible' at all receptors and will not result in any exceedances of the relevant air quality objectives. As such, the overall effect of operational traffic on existing properties will be 'not significant'.
- 7.6 The impact of local air quality on future residents of the proposed development has also been considered. The Site, and proposed residences, are located well away from nearby main roads and, therefore, are expected to experience concentrations of pollutants comparable to 'background' levels. Background concentrations of pollutants within the Site are predicted to fall well below the relevant objectives. As such, it is considered that future residents of the proposed development will experience good air quality, and that the Site is suitable for its proposed end-use without mitigation.

- 7.7 Damage costs have been calculated using guidance and tools provided by the Sussex-air Air Quality Partnership and Defra. It is a requirement that costs equivalent to the calculated damage cost value, as a minimum, shall be spent on air quality mitigation measures. A list of possible mitigation measures has been provided within this AQA. The selected mitigation measures shall be submitted to, and approved by, HDC.
- 7.8 Standard mitigation measures required to be implemented by the Sussex-air guidance (Sussex-air Air Quality Partnership, 2021) have been identified, and are listed within this AQA.
- 7.9 Overall, it is concluded that there are no air quality constraints to the proposed development.

## 8.0 REFERENCES

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## Appendix A Glossary

| Abbreviations   | Meaning                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| AADT            | Annual Average Daily Traffic                                                                                                                   |
| ACE             | Ardent Consulting Engineers                                                                                                                    |
| ADMS            | Air Dispersion Modelling System                                                                                                                |
| AQAP            | Air Quality Action Plan                                                                                                                        |
| AQA             | Air Quality Assessment                                                                                                                         |
| AQMA            | Air Quality Management Area                                                                                                                    |
| ASR             | Annual Status Report                                                                                                                           |
| AURN            | Automatic Urban and Rural Network                                                                                                              |
| BST             | British Summer Time                                                                                                                            |
| CEMP            | Construction Environmental Management Plan                                                                                                     |
| CROW Act        | Countryside and Rights of Way Act                                                                                                              |
| Defra           | Department for Environment, Food and Rural Affairs                                                                                             |
| DfT             | Department for Transport                                                                                                                       |
| Diffusion Tube  | A passive sampler used for collecting NO <sub>2</sub> in the air                                                                               |
| DMP             | Dust Management Plan                                                                                                                           |
| EA              | Environment Agency                                                                                                                             |
| EC              | European Commission                                                                                                                            |
| EFT             | Emission Factor Toolkit                                                                                                                        |
| EPUK            | Environmental Protection UK                                                                                                                    |
| EEA             | European Environment Agency                                                                                                                    |
| EEC             | European Economic Community                                                                                                                    |
| EIA             | Environmental Impact Assessment                                                                                                                |
| EMEP            | European Monitoring and Evaluation Programme                                                                                                   |
| HDV             | Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses                     |
| IAQM            | Institute of Air Quality Management                                                                                                            |
| LAEI            | London Atmospheric Emissions Inventory                                                                                                         |
| LAQM            | Local Air Quality Management                                                                                                                   |
| LEV             | Low Emission Vehicle                                                                                                                           |
| LDV             | Light Duty Vehicle; a vehicle with a gross vehicle weight equal to or less than 3.5 tonnes, includes Light Goods Vehicles, cars and motorbikes |
| NAEI            | National Atmospheric Emissions Inventory                                                                                                       |
| NAQO            | National Air Quality Objective as set out in Air Quality Strategy and the Air Quality Regulations                                              |
| NH <sub>3</sub> | Ammonia                                                                                                                                        |
| NO              | Nitric Oxide                                                                                                                                   |

| Abbreviations                         | Meaning                                                                                                                                                                                                                         |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO <sub>2</sub>                       | Nitrogen Dioxide                                                                                                                                                                                                                |
| NO <sub>x</sub>                       | Nitrogen Oxides, generally considered to be nitric oxide and NO <sub>2</sub> . The main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles and natural gas used in gas-fired boilers. |
| NPPF                                  | National Planning Policy Framework                                                                                                                                                                                              |
| NRMM                                  | Non-road mobile machinery                                                                                                                                                                                                       |
| PCM                                   | Pollution Climate Mapping                                                                                                                                                                                                       |
| PM <sub>10</sub> or PM <sub>2.5</sub> | Small airborne particles less than 10/2.5 µg in diameter                                                                                                                                                                        |
| PPG                                   | Planning Practice Guidance                                                                                                                                                                                                      |
| Receptor                              | A location where the effects of pollution may occur                                                                                                                                                                             |
| RMSE                                  | Root Mean Square Error                                                                                                                                                                                                          |
| SAC                                   | Special Area of Conservation                                                                                                                                                                                                    |
| SPA                                   | Special Protection Area                                                                                                                                                                                                         |
| SSSI                                  | Site of Special Scientific Interest                                                                                                                                                                                             |
| TEMPro                                | Trip End Model Presentation Programme                                                                                                                                                                                           |
| TfL                                   | Transport for London                                                                                                                                                                                                            |
| ULEV                                  | Ultra-Low Emission Vehicle                                                                                                                                                                                                      |
| UNESCO                                | United Nations Educational, Scientific and Cultural Organisation                                                                                                                                                                |

## Appendix B      IAQM Dust Assessment Approach

### B1    Step 1: Screen the need for an assessment

B1.1    Step 1 is the screen the need for an assessment against the following criteria:

- 'Human receptor' within:
  - 350 m (50 m in London) of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- 'Ecological receptor' within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

B1.2    Where there are no sensitive receptors within these distances, it can be concluded that the impact is negligible and no further assessment relating to construction dust impacts is required.

### B2    Step 2: Assess the risk of dust impacts

B2.1    The risk of dust at sufficient quantum to cause annoyance/health/ecological impacts should be based on:

- The scale and nature of the works (potential dust emission magnitude) (
- **Table B.1**); and
- The sensitivity of the area to dust impacts based on the matrices shown in **Table B.2**, **Table B.3** and **Table B.4**.

B2.2    These factors are then combined to determine the risk of dust impacts without mitigation applied for each of the four activities (Demolition, Earthworks, Construction and Trackout) following the matrices shown in **Table B.5**, **Table B.6** and **Table B.7**.

**Table B.1: Potential Dust Emission Magnitude**

| Size                | Definition                                                                                                                                                                                                                                                   |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Demolition</b>   |                                                                                                                                                                                                                                                              |
| Small               | Total building volume <20,000 m <sup>3</sup> , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.                                         |
| Medium              | Total building volume 20,000 m <sup>3</sup> – 50,000 m <sup>3</sup> , potentially dusty construction material, demolition activities 10-20 m above ground level.                                                                                             |
| Large               | Total building volume >50,000 m <sup>3</sup> , potentially dusty construction material (e.g. Concrete), on-site crushing and screening, demolition activities >20 m above ground level.                                                                      |
| <b>Earthworks</b>   |                                                                                                                                                                                                                                                              |
| Small               | Total site area <2,500 m <sup>2</sup> , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes earthworks during wetter months.          |
| Medium              | Total site area 2,500 m <sup>2</sup> – 10,000 m <sup>2</sup> , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes. |
| Large               | Total site area >10,000 m <sup>2</sup> , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height.          |
| <b>Construction</b> |                                                                                                                                                                                                                                                              |
| Small               | Total building volume <25,000 m <sup>3</sup> , construction material with low potential for dust release (e.g. metal cladding or timber).                                                                                                                    |
| Medium              | Total building volume 25,000 m <sup>3</sup> – 100,000 m <sup>3</sup> , potentially dusty construction material (e.g. concrete), on site concrete batching.                                                                                                   |
| Large               | Total building volume >100,000 m <sup>3</sup> , on site concrete batching, sandblasting.                                                                                                                                                                     |
| <b>Trackout</b>     |                                                                                                                                                                                                                                                              |
| Small               | <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.                                                                                                                           |
| Medium              | 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.                                                                                                            |
| Large               | >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.                                                                                                                   |

**Table B.2: Sensitivity of the Area to Dust Soiling Effects on People and Property**

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

**Table B.3: Sensitivity of the Area to Human Health Impacts**

| Receptor Sensitivity | Annual Mean PM <sub>10</sub> Concentration | Number of Receptors | Distance from the Source (m) |        |        |      |
|----------------------|--------------------------------------------|---------------------|------------------------------|--------|--------|------|
|                      |                                            |                     | <20                          | <50    | <100   | <350 |
| High                 | >32 µg/m <sup>3</sup> <sup>a</sup>         | >100                | High                         | High   | High   | Low  |
|                      |                                            | 10-100              | High                         | High   | Medium | Low  |
|                      |                                            | <10                 | High                         | Medium | Low    | Low  |
|                      | 28-32 µg/m <sup>3</sup> <sup>b</sup>       | >100                | High                         | High   | Medium | Low  |
|                      |                                            | 10-100              | High                         | Medium | Low    | Low  |
|                      |                                            | <10                 | High                         | Medium | Low    | Low  |
|                      | 24-28 µg/m <sup>3</sup> <sup>c</sup>       | >100                | High                         | Medium | Low    | Low  |
|                      |                                            | 10-100              | High                         | Medium | Low    | Low  |
|                      |                                            | <10                 | Medium                       | Low    | Low    | Low  |
|                      | <24 µg/m <sup>3</sup> <sup>d</sup>         | >100                | Medium                       | Low    | Low    | Low  |
|                      |                                            | 10-100              | Low                          | Low    | Low    | Low  |
|                      |                                            | <10                 | Low                          | Low    | Low    | Low  |
| Medium               | >32 µg/m <sup>3</sup> <sup>a</sup>         | >100                | High                         | Medium | Low    | Low  |
|                      |                                            | 10-100              | Medium                       | Low    | Low    | Low  |
|                      |                                            | <10                 | Medium                       | Low    | Low    | Low  |
|                      | 28-32 µg/m <sup>3</sup> <sup>b</sup>       | >100                | Low                          | Low    | Low    | Low  |
|                      |                                            | 10-100              | Low                          | Low    | Low    | Low  |
|                      |                                            | <10                 | Low                          | Low    | Low    | Low  |
|                      | 24-28 µg/m <sup>3</sup> <sup>c</sup>       | >100                | Low                          | Low    | Low    | Low  |
|                      |                                            | 10-100              | Low                          | Low    | Low    | Low  |
|                      |                                            | <10                 | Low                          | Low    | Low    | Low  |
|                      | <24 µg/m <sup>3</sup> <sup>d</sup>         | >100                | Low                          | Low    | Low    | Low  |
|                      |                                            | 10-100              | Low                          | Low    | Low    | Low  |
|                      |                                            | <10                 | Low                          | Low    | Low    | Low  |
| Low                  | -                                          | ≥1                  | Low                          | Low    | Low    | Low  |

<sup>a</sup> >18µg/m<sup>3</sup> in Scotland.<sup>b</sup> 16-18 µg/m<sup>3</sup> in Scotland.<sup>c</sup> 14-16 µg/m<sup>3</sup> in Scotland.<sup>d</sup> <14 µg/m<sup>3</sup> in Scotland.

**Table B.4: Sensitivity of the Area to Ecological Impacts**

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

**Table B.5: Risk of Impacts – Demolition**

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

**Table B.6: Risk of Impacts – Earthworks and Construction**

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

**Table B.7: Risk of Impacts – Trackout**

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

**B3 Step 3: Site-specific Mitigation**

B3.1 Based on the outcome of Step 2, appropriate mitigation measures are recommended. The guidance includes a list of mitigation measures for Low, Medium and High Risk sites but final recommendations should be based on professional judgement and take into account particular site sensitivities and differences in risk for different activities or areas of the site. The mitigation recommended in the guidance are shown in **Table B.8**.

**Table B.8: Mitigation Measures (H = Highly Recommended, D = Desirable and N = Not Recommended)**

| Mitigation Measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Low Risk | Medium Risk | High Risk |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------|
| <b>Communications</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |             |           |
| 1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | N        | H           | H         |
| 2. 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.                                                                                                                                                                                                                                                                                                                                                                                                               | H        | H           | H         |
| 3. Display the head or regional office contact information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | H        | H           | H         |
| <b>Dust Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |             |           |
| 4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM <sub>10</sub> continuous monitoring and/or visual inspections. | D        | H           | H         |
| <b>Site Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |             |           |
| 5. 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.                                                                                                                                                                                                                                                                                                                                                                                                                                     | H        | H           | H         |
| 6. Make the complaints log available to the local authority when asked.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H        | H           | H         |

| Mitigation Measure                                                                                                                                                                                                                                                                                                                                                                                | Low Risk | Medium Risk | High Risk |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------|
| 7. Record any exceptional 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.                                                                                                                                                                                                                                 | H        | H           | H         |
| 8. Hold regular liaison meetings with other high risk construction sites within 500 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.                                            | N        | N           | H         |
| <b>Monitoring</b>                                                                                                                                                                                                                                                                                                                                                                                 |          |             |           |
| 9. 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. | D        | D           | H         |
| 10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.                                                                                                                                                                                                                     | H        | H           | H         |
| 11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.                                                                                                                                                        | H        | H           | H         |
| 12. Agree dust deposition, dust flux, or real-time PM <sub>10</sub> continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.        | N        | H           | H         |
| <b>Preparing and maintaining the site</b>                                                                                                                                                                                                                                                                                                                                                         |          |             |           |
| 13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.                                                                                                                                                                                                                                                                        | H        | H           | H         |
| 14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.                                                                                                                                                                                                                                                             | H        | H           | H         |
| 15. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.                                                                                                                                                                                                                                                 | D        | H           | H         |

| Mitigation Measure                                                                                                                                                                                                                                                                                                                                                | Low Risk | Medium Risk | High Risk |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------|
| 16. Avoid site runoff of water or mud.                                                                                                                                                                                                                                                                                                                            | H        | H           | H         |
| 17. Keep site fencing, barriers and scaffolding clean using wet methods.                                                                                                                                                                                                                                                                                          | D        | H           | H         |
| 18. 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.                                                                                                                                                                               | D        | H           | H         |
| 19. Cover, seed or fence stockpiles to prevent wind whipping.                                                                                                                                                                                                                                                                                                     | D        | H           | H         |
| <b>Operating vehicle/machinery and sustainable travel</b>                                                                                                                                                                                                                                                                                                         |          |             |           |
| 20. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable.                                                                                                                                                                                                                     | H        | H           | H         |
| 21. Ensure all vehicles switch off engines when stationary - no idling vehicles.                                                                                                                                                                                                                                                                                  | H        | H           | H         |
| 22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.                                                                                                                                                                                                                                | H        | H           | H         |
| 23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). | D        | D           | H         |
| 24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.                                                                                                                                                                                                                                                              | N        | H           | H         |
| 25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).                                                                                                                                                                                                                                | N        | D           | H         |
| <b>Operations</b>                                                                                                                                                                                                                                                                                                                                                 |          |             |           |
| 26. 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.                                                                                                                                                  | H        | H           | H         |
| 27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.                                                                                                                                                                                             | H        | H           | H         |
| 28. Use enclosed chutes and conveyors and covered skips.                                                                                                                                                                                                                                                                                                          | H        | H           | H         |
| 29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.                                                                                                                                                                                      | H        | H           | H         |

| Mitigation Measure                                                                                                                                                                                                                                                                                                                                                     | Low Risk | Medium Risk | High Risk |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------|
| 30. 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.                                                                                                                                                                                     | D        | H           | H         |
| <b>Waste Management</b>                                                                                                                                                                                                                                                                                                                                                |          |             |           |
| 31. Avoid bonfires and burning of waste materials.                                                                                                                                                                                                                                                                                                                     | H        | H           | H         |
| <b>Demolition</b>                                                                                                                                                                                                                                                                                                                                                      |          |             |           |
| 32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).                                                                                                                                                                                                          | D        | D           | H         |
| 33. 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. | H        | H           | H         |
| 34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.                                                                                                                                                                                                                                                                                     | H        | H           | H         |
| 35. Bag and remove any biological debris or damp down such material before demolition.                                                                                                                                                                                                                                                                                 | H        | H           | H         |
| <b>Earthworks</b>                                                                                                                                                                                                                                                                                                                                                      |          |             |           |
| 36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.                                                                                                                                                                                                                                                             | N        | D           | H         |
| 37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.                                                                                                                                                                                                                                         | N        | D           | H         |
| 38. Only remove the cover in small areas during work and not all at once.                                                                                                                                                                                                                                                                                              | N        | D           | H         |
| <b>Construction</b>                                                                                                                                                                                                                                                                                                                                                    |          |             |           |
| 39. Avoid scabbling (roughening of concrete surfaces) if possible.                                                                                                                                                                                                                                                                                                     | D        | D           | H         |
| 40. 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.                                                                                                                                      | D        | H           | H         |
| 41. 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.                                                                                                                                                     | N        | D           | H         |
| 42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.                                                                                                                                                                                                                                            | N        | D           | D         |

| Mitigation Measure                                                                                                                                                                           | Low Risk | Medium Risk | High Risk |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|-----------|
| <b>Trackout</b>                                                                                                                                                                              |          |             |           |
| 43. 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. | D        | H           | H         |
| 44. Avoid dry sweeping of large areas.                                                                                                                                                       | D        | H           | H         |
| 45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.                                                                                  | D        | H           | H         |
| 46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.                                                              | N        | H           | H         |
| 47. Record all inspections of haul routes and any subsequent action in a site log book.                                                                                                      | D        | H           | H         |
| 48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned.                                | N        | H           | H         |
| 49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).                                        | D        | H           | H         |
| 50. 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.                                         | N        | H           | H         |
| 51. Access gates to be located at least 10 m from receptors where possible.                                                                                                                  | N        | H           | H         |

#### **B4 Step 4: Determine Significant Effects**

B4.1 Recommended mitigation measures should be sufficient to ensure that the impact is normally 'not significant'. There may at times be limitations to appropriate mitigation measures (such as lack of water) and therefore, an assessment should always be made based on the characteristic of each site and the surrounding area.

#### **B5 Step 5: Dust Assessment Report**

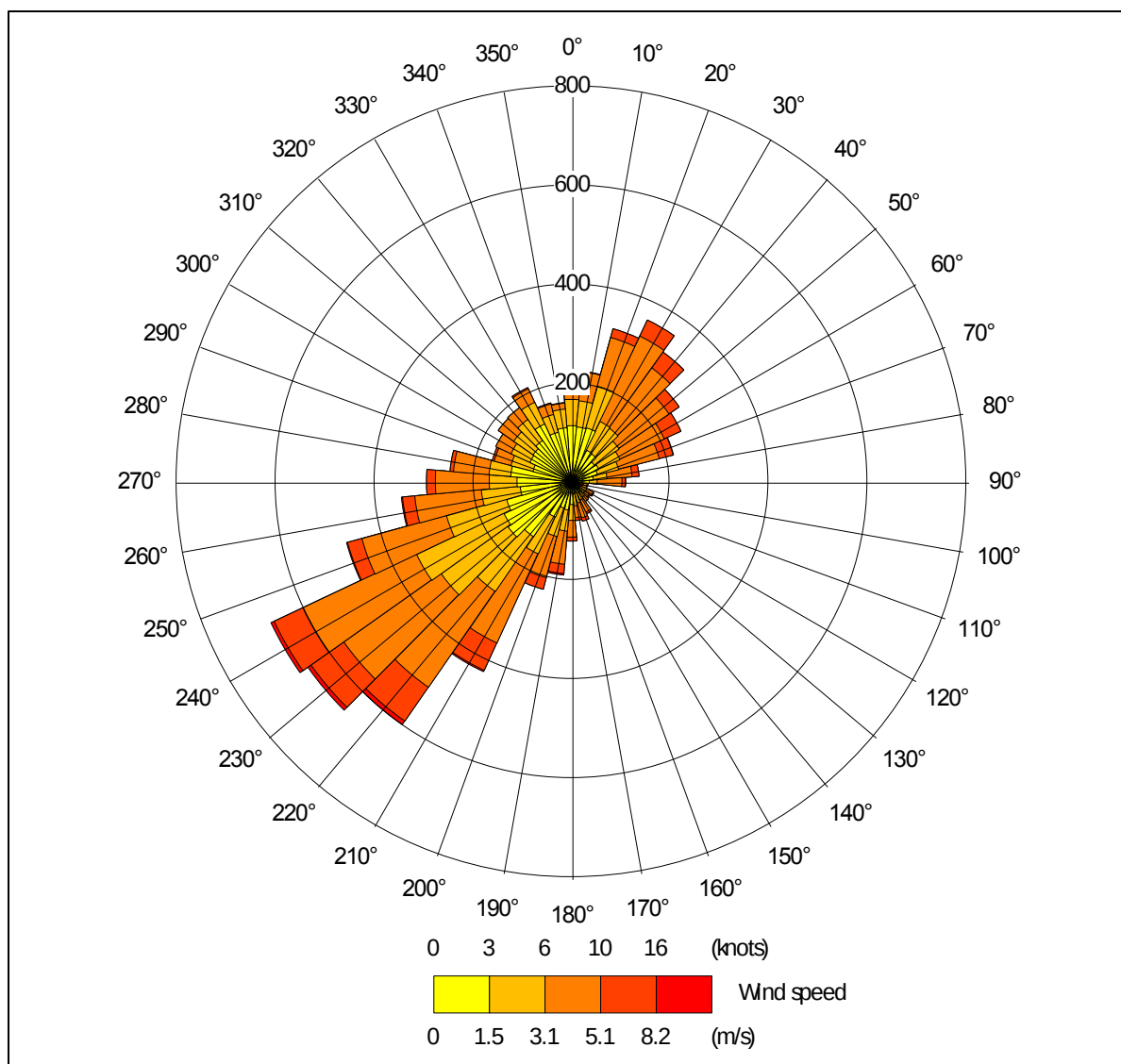
B5.1 The dust assessment report should include enough detail to ensure that the basis for the determination of emission magnitude and sensitivity of the area, and therefore the site risk, are clear. The required mitigation so also be set out within the report, along with a description of the mechanism that will ensure that the appropriate level of mitigation will be implemented (such as through a planning condition).

## Appendix C Road Model Inputs and Results Processing

### C1 Model Inputs and Results Processing Tools

|                                |                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model Version                  | ADMS-Roads v5.0.1, January 2022                                                                                                                                                            |
| Street Canyons                 | The ADMS Advanced Street Canyon Module was used to represent the effect of reduced dispersion and recirculating pollutants in street canyons. The canyons are shown in <b>Appendix D</b> . |
| British Summer Time (BST)      | Adjustment for BST was made within the model, based on the following dates and times:<br><br>BST begins – 01:00 on 28/03/2021<br><br>BST ends – 02:00 on 31/10/2021                        |
| Emission Factor Toolkit (EFT)  | v11.1, November 2020 ( <b>Defra, 2021c</b> )                                                                                                                                               |
| Time Varying Emissions Factors | Based on Department for Transport (DfT) statistics, Table TRA0307: Motor Vehicle Traffic Distributed by Time of Day and Day of the Week on all roads, Great Britain: 2021.                 |
| Meteorological Data            | 2021 hourly meteorological data from the Charlwood met station has been used in the model. The wind rose is shown in <b>Figure C.1</b> .                                                   |
| Latitude                       | 50.5°                                                                                                                                                                                      |

|                                               |                                                                                                                                                                                                            |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Surface Roughness                             | <p>A value of 0.5 for 'Parkland, open suburbia' was used to represent the main study area.</p> <p>A value of 0.3 for 'Agricultural areas (max)' was used to represent the meteorological station site.</p> |
| Minimum Monin-Obukhov Length                  | <p>A value of 10 for 'Small towns &lt; 50,000' was used to represent the main study area and the meteorological station site.</p>                                                                          |
| NO <sub>x</sub> to NO <sub>2</sub> conversion | <p>NO<sub>x</sub> to NO<sub>2</sub> calculator v8.1 <b>(Defra, 2019)</b></p>                                                                                                                               |
| Background Maps                               | <p>2018 reference year background maps <b>(Defra, 2020b)</b></p>                                                                                                                                           |



**Figure C.1: 2021 Charlwood Wind Rose**

## C2 Verification

### ***Nitrogen Dioxide***

C2.1 Most nitrogen dioxide ( $\text{NO}_2$ ) is produced in the atmosphere by a reaction between nitric oxide ( $\text{NO}$ ) and ozone. It is, therefore, most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides ( $\text{NO}_x$ ) (i.e.  $\text{NO}_x = \text{NO} + \text{NO}_2$ ). The model has been run to predict the annual mean road- $\text{NO}_x$  contribution in 2021 at two monitoring locations; diffusion tube monitoring site 39 and 40 (see **Figure 4.1** and **Table 4-1**). Concentrations at monitoring sites 39 and 40 have been modelled at heights of 2.6 m and 2.2 m respectively.

C2.2 The choice of appropriate monitoring sites for verification has been based on:

- Appropriateness of site (roadside rather than background sites, presence of additional emission sources etc.);
- Distance from study area;
- Availability of traffic data for modelling; and
- Data capture (monitoring sites 39 and 40 both have 100% data capture in 2021).

C2.3 Annual mean background NO<sub>2</sub> concentrations at each of the monitoring site used for verification purposes have been predicted as described in Paragraph 4.13, and are presented in **Table C.2** below. Predicted annual mean concentrations have then been used for further verification calculations (including within the NO<sub>x</sub> to NO<sub>2</sub> calculator).

**Table C.1: Predicted 2021 Annual Mean Background Concentrations (µg/m<sup>3</sup>)**

| Monitoring Site | NO <sub>2</sub> |
|-----------------|-----------------|
| 39              | 9               |
| 40              | 8               |

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source.

C2.4 The model output of road-NO<sub>x</sub> has been compared with the 'measured' road-NO<sub>x</sub>, which was calculated from the measured NO<sub>2</sub> concentrations within the NO<sub>x</sub> from NO<sub>2</sub> calculator.

C2.5 A primary adjustment factor has been determined as the slope of the best fit line between the 'measured' road contribution and the modelled road contribution, forced through zero (**Figure C.2**). This factor has then been applied to the modelled road-NO<sub>x</sub> concentrations. The total NO<sub>2</sub> concentrations have then been determined by combining the adjusted modelled road-NO<sub>x</sub> with the predicted background NO<sub>2</sub> concentration within the NO<sub>x</sub> from NO<sub>2</sub> calculator. A secondary adjustment factor has then been calculated as the slope of best fit between the measured NO<sub>2</sub> and primary adjusted, modelled NO<sub>2</sub>, forced through zero (**Figure C.3**).

C2.6 The following primary and secondary adjustment factors have been calculated and applied to all modelled data:

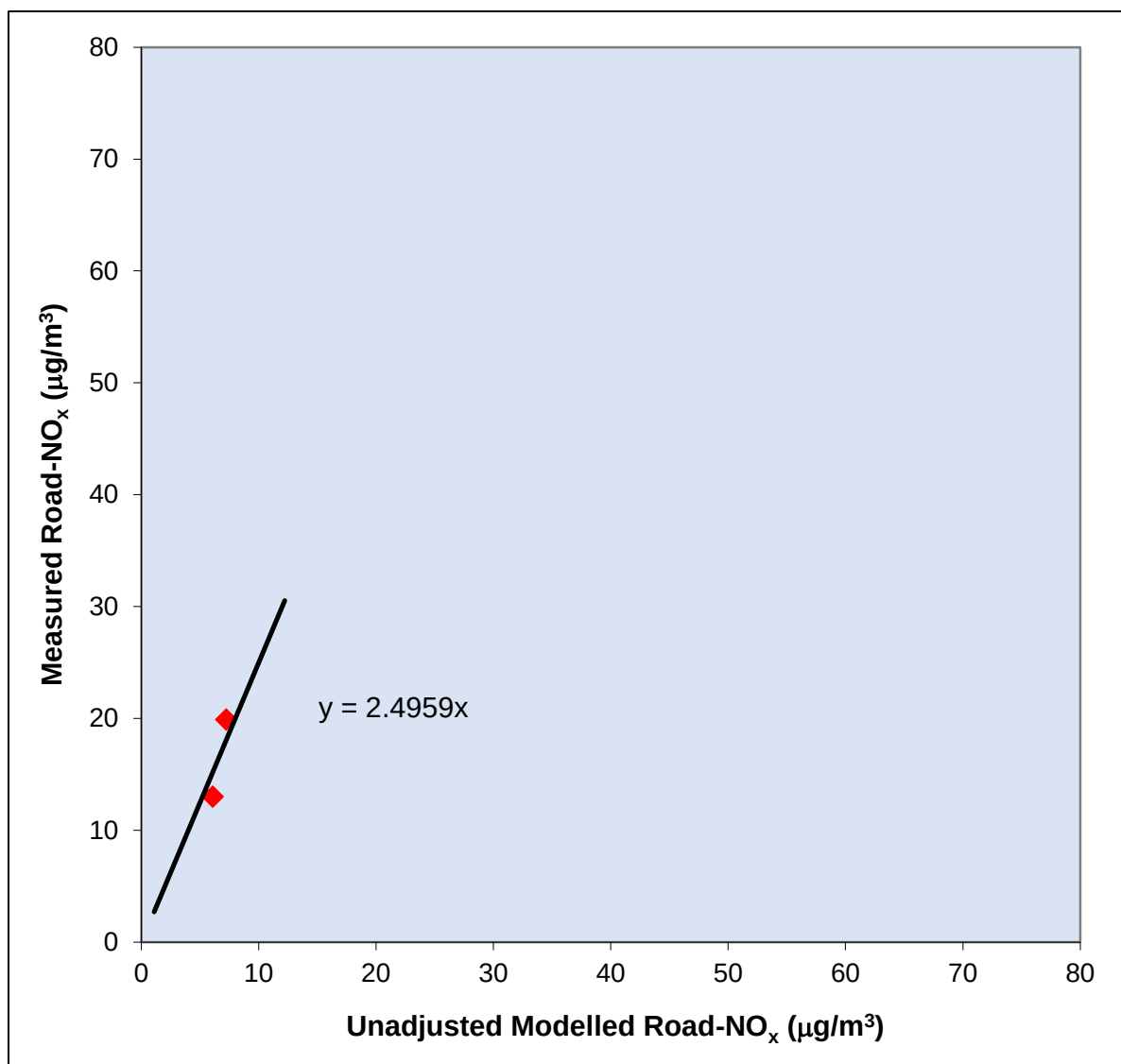
Primary NO<sub>x</sub> adjustment factor: 2.49591

Secondary NO<sub>2</sub> adjustment factor: 0.99692

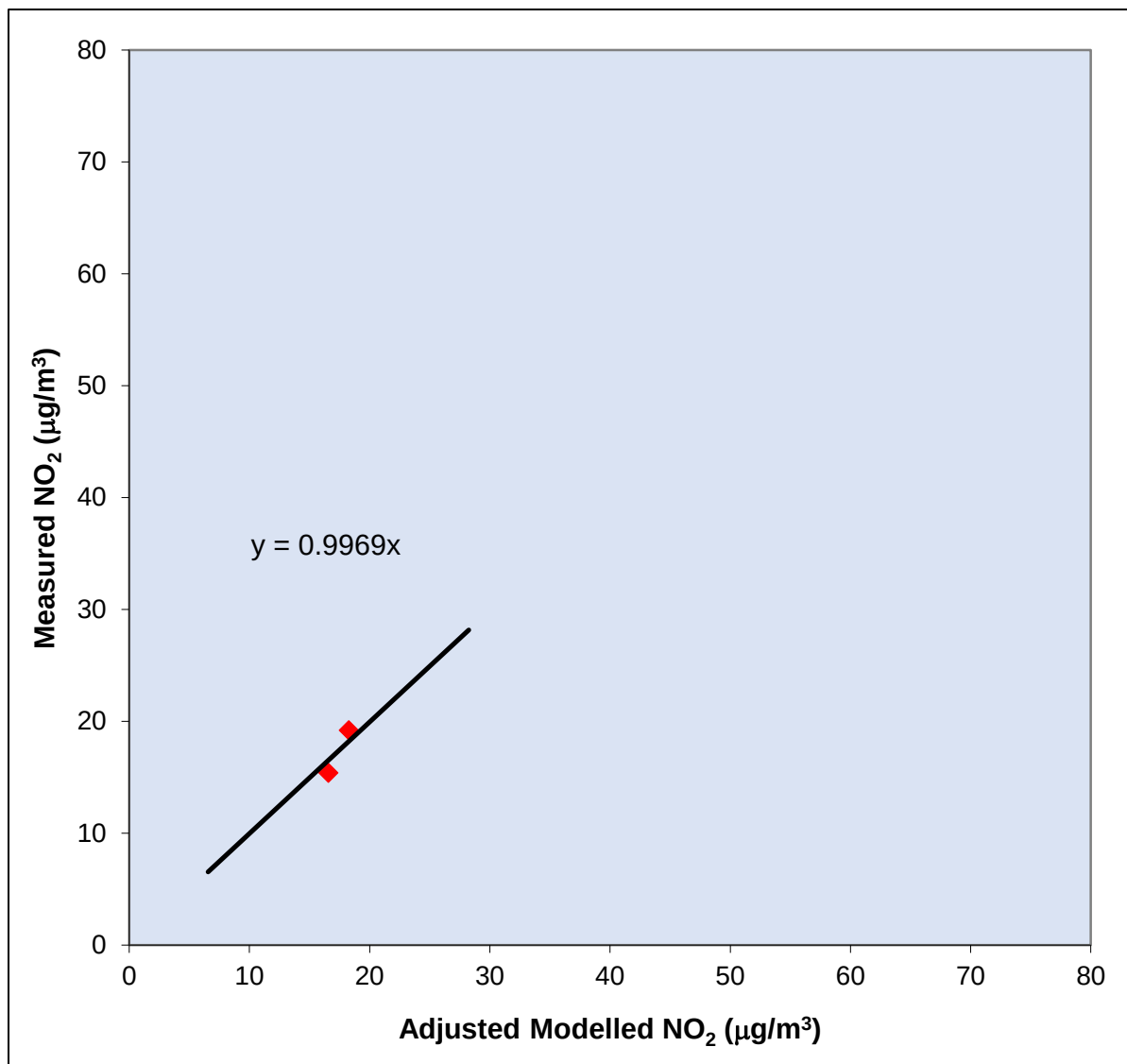
C2.7 The results imply that overall, the model was under-predicting the road-NO<sub>x</sub> contribution. This is a common experience with this and most other models. The secondary NO<sub>2</sub> adjustment is minor.

C2.8 The Root Mean Square Error (RMSE) has been calculated as The Root Mean Square Error (RMSE) has been calculated as 1.1 µg/m<sup>3</sup> (2.6 %) which is within the guideline variance recommended within LAQM.TG(22) (**Defra, 2022b**).

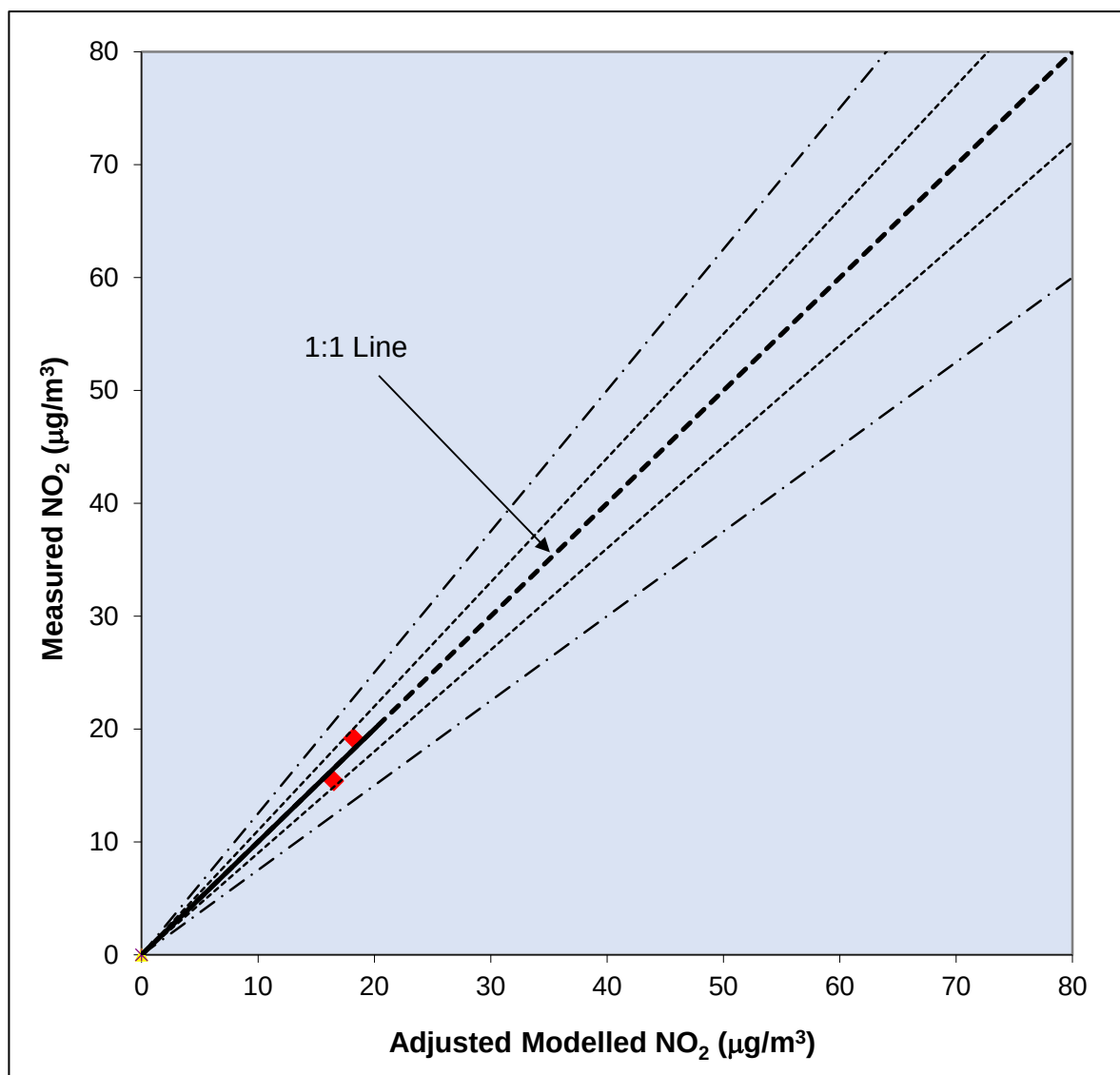
C2.9 **Figure C.4** compares the adjusted modelled, total NO<sub>2</sub> at each of the modelling sites with the measured total NO<sub>2</sub> and shows the 1:1 relationship as well as ±10% and ±25% of the 1:1 line. Both verification sites lie within ±10% of the 1:1 line.



**Figure C.2: Measured Road-NO<sub>x</sub> / Modelled Road-NO<sub>x</sub> Concentrations**



**Figure C.3: Measured NO<sub>2</sub> / Primary Adjusted Modelled NO<sub>2</sub> Concentrations**



**Figure C.4: Measured NO<sub>2</sub> / Fully Adjusted Modelled NO<sub>2</sub> Concentrations**

***PM<sub>10</sub> and PM<sub>2.5</sub>***

C2.10 There are no PM<sub>10</sub> or PM<sub>2.5</sub> monitoring sites located in close proximity to the development Site. Therefore, the primary adjustment factor calculated for road-NO<sub>x</sub> has been applied to the modelled road-PM<sub>10</sub> and road-PM<sub>2.5</sub> concentrations.

## Appendix D Traffic Data and Road Network

**Table D.1: Summary of Modelled Traffic Data; Main Study Area**

| Road Link                           | Average Speed (kph) <sup>a</sup> | 2025 Without Scheme |      | 2025 With Scheme |      |
|-------------------------------------|----------------------------------|---------------------|------|------------------|------|
|                                     |                                  | AADT                | %HDV | AADT             | %HDV |
| Church Close (West of Church Lane)  | 30 (20)                          | 132                 | 7    | 1,267            | 1    |
| Church Close (North of Church Lane) | 30 (20)                          | 711                 | 6    | 734              | 5    |
| Church Lane                         | 30 (20)                          | 965                 | 6    | 2,066            | 3    |
| London Road (North)                 | 48                               | 4,233               | 3    | 4,869            | 4    |
| London Road (South)                 | 48 (20)                          | 4,384               | 3    | 4,849            | 4    |

<sup>a</sup> The average speed of slowed sections of road are provided in brackets, where applicable.

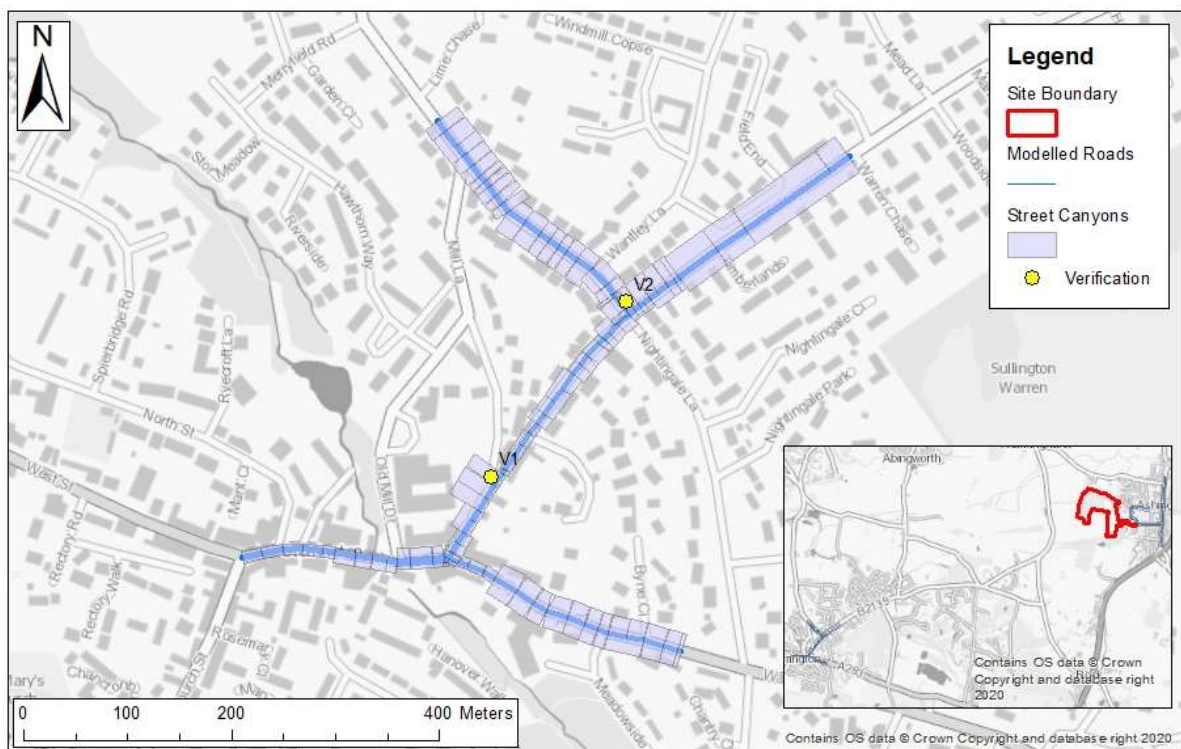
**Table D.2: Summary of Modelled Traffic Data; Verification Area**

| Road Link   | Average Speed (kph) <sup>a</sup> | 2021 Baseline |      |
|-------------|----------------------------------|---------------|------|
|             |                                  | AADT          | %HDV |
| Fryern Road | 48 (20)                          | 2,672         | 1    |
| A283        | 30 (20)                          | 16,435        | 2    |
| B2139       | 48 (30, 20)                      | 7,128         | 1    |

<sup>a</sup> The average speed of slowed sections of road are provided in brackets, where applicable.



**Figure D.1: Modelled Road Network - (inc. Street Canyons & Site Boundary)**



**Figure D.2: Modelled Road Network - (inc. Street Canyons & Verification Site)**