

**Land West of Worthing Road,
Southwater – Phase 5**

**Prepared for
Berkeley Homes**

by

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ACRONYMS AND ABBREVIATIONS

ATC	Automated Traffic Count
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
DEV	Development generated traffic
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
g/km/s	grams per kilometre per second
ha	Hectares - a unit of measure equal to 2.471 acres or 10,000 m ³
HDC	Horsham District Council
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Managements
MCC	Manual Classified Traffic Count
ms ⁻¹	wind speed in meters per second
NAQO	National Air Quality Objectives (2002)
NSCA	National Society for Clean Air
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NTM	National Transport Model
PM ₁₀	Particulate matter with an aerodynamic diameter less than 10 microns
SDPD	Sites and Detailed Policies Document
SMA	Stuart Michael Associates Limited
TEMPRO	Trip End Model Presentation Program
µgm ⁻³	Micrograms per cubic meter



1.0 INTRODUCTION

1.1 Stuart Michael Associates (SMA), Consulting Engineers, has been appointed by Berkeley Homes (Southern Limited) (the Applicant) to undertake an Air Quality Assessment for the proposed development on Land West of Worthing Road, Southwater – Phase 5 (refer to **Figure 1.1** for the site location). The development site is situated within the area administered by Horsham District Council (HDC), West Sussex.

1.2 This report supports a full planning application for Phase 5 of the Southwater development which involves the erection of 94 residential units, with the associated vehicular and pedestrian access, car parking and landscaping on the Land West of Worthing Road, Southwater. Refer to **Appendix 1** (Drawing Number S835/SL/001 Revision D Dated 26/06/24) for a copy of the proposed Site Layout.

Site Description

1.3 The centre of the Site is located approximately 450m west of Southwater village centre and 175m south of Church Lane.

1.4 The Site is approximately 6.8 hectares in area and currently comprises greenfield land.

1.5 The Site is bound by earlier phases of the Southwater residential development to the north and east (yet to commence) and immediately west is Shaw's Lane.

1.6 The proposed development site is not located within an Air Quality Management Area AQMA. Refer to **Appendix 2** for the location of HDC Air Quality Management Areas (AQMA).

Assessment Methodology

1.7 The report addresses the effects of air pollutant emissions from road traffic using the adjacent roads, rail traffic on the railway line and the way they impact the site and surrounding area. Also considered are the emissions associated with the construction of the Proposed Development.

1.8 The report has been split into two parts; the first part assesses the impact of the development on surrounding sensitive receptors and the second part assesses the constraints on the development (i.e. how the existing environment will impact on the development).



- 1.9 Road traffic flows on the local highway network have been obtained from permanent automatic traffic counters (ATC) and from the Transport Consultants. Where necessary, the collected traffic flows have been growthed to the assessment years using TEMPRO.
- 1.10 The dispersion modelling software ADMS Roads has been used to determine the concentrations of pollutants at the development site and assess the likely changes in the concentrations of pollutants. Background concentrations of pollutants have been obtained from the Department for Environment Food and Rural Affairs (DEFRA) website.
- 1.11 Construction dust impacts on local receptors have been assessed using the method detailed in the Institute of Air Quality Management (IAQM) publication “Guidance on the assessment of dust from demolition and construction” (2023).
- 1.12 The principles in the IAQM document Land Use Planning & Development Control: Planning for Air Quality January 2017 have also been taken into account. In addition, the Sussex-air guidance document, Air quality and emissions mitigation guidance for Sussex (2021), has been considered when recommending appropriate mitigation measures.

Report Outline

- 1.13 The report assesses the overall levels of oxides of nitrogen (NO_x), nitrogen dioxide (NO₂) and particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀) within the development site and at four sensitive receptor locations. The base year for the development is 2024 and the future year of assessment is 2028, which is the predicted year of opening. Verification has been undertaken for 2019.



2.0 LEGISLATION AND PLANNING POLICY CONTEXT

Introduction

- 2.1 Poor air quality is the largest environmental risk to public health. Over recent years, UK air quality has improved significantly as a result of concerted action. Total UK emissions of nitrogen oxides (NO_x) have fallen by 77% since 1970. There has not been much change since 2020 due to the Covid-19 restriction which continued to reduce traffic on many roads in early 2021. Between 1990 and 2021 there was an average reduction of 4% which demonstrates that there is a downward trend in NO_x emissions in the UK*.
- 2.2 In the UK, emissions from road transport account for a substantial proportion of national air pollutant emissions. Road transport accounted for 31% of national carbon dioxide (CO₂) emissions in 2020 even though emissions fell by 3.1% between 2000 and 2018. Emissions from road transport of nitrogen dioxide (NO₂) and particulate matter smaller than 10µm in diameter (PM₁₀) also fell between 2000 and 2018[†]. Total pollutant emissions from cars peaked in 1990/91 and declined to 2009. *“Average CO₂ emissions from cars registered for the first time were steadily falling since 2003, but began to rise from mid-2016 through to 2019. This increase was broadly due to a shift towards registering larger cars (which have higher emissions) and increases in emissions for popular petrol car models. The introduction of WLTP in September 2018 caused a marked increase in average CO₂ emissions. However, changes from September 2018 are not directly comparable with previous periods”[‡].*
- 2.3 Private car ownership has grown from 24.4 million in 2000 to 38.7 million at the end of 2019. At the end of December 2022, there were 40.7 million licensed vehicles in the UK, which was a 1.0% increase compared to the end of December 2021, and a 2.3% increase compared to the end of December 2020.
- 2.4 Of the licensed vehicles using the highway network, cars accounted for 81.5%, light goods vehicles (<3.5t) 11.3%, HGV's (>3.5t) 1.3%, motorcycles 3.5%, Bus's and Coaches 0.4%, and “other vehicles” 2.1% of all motor vehicle traffic at the end of 2022[§].
- 2.5 The percentage of different fuel type usage for private cars has significantly changed since the mid-1990s. At the end of 2022 there were 11.7 million diesel

* DEFRA National Statistics Release: Emissions of air pollutants in the UK, 1970 to 2021 – Statistical Release: Updated 22nd February 2023

[†] Department for Transport Statistics: Road Traffic Estimates: Great Britain 2021 – Released 28th September 2022

[‡] Department for Transport (DfT), Vehicle Licensing Statistics: Annual 2019 – Published 30th April 2020

[§] DfT Statistics - Vehicle Licensing Statistics: Annual 2022



cars, accounting for 35% of the total, up from 11% in 1997 but down from a peak of 40% in 2016, 2017 and 2018. Alternative fuel vehicles which include gas, electricity, or a combination such as gas bi-fuel and hybrid electric were up to 2.5 million by the end of 2022.

- 2.6 At the end of December 2022, there were 1.103 million licensed Ultra-Low Emission Vehicles (ULEVs) in the UK. This was an increase of 49% compared to the end of 2021, when there were 0.739 million.
- 2.7 During 2022, 391,000 new ULEVs were registered for the first time, which is a 22% increase when compared with the previous year. This amounted to 18% of all new vehicle registrations in 2022, up from 14% in 2021**.

National Air Quality Strategy

- 2.8 In 1997 the United Kingdom National Air Quality Strategy (NAQS) was published and for the first time. The document set out an analysis of the magnitude and potential health and environmental problems associated with, amongst other things, air pollutant emissions resulting from road traffic.
- 2.9 It proposed a schedule of air quality objectives which were to be met in the years up to 2005. In setting these objectives, health and socio-economic cost-benefit factors were considered, together with the practical and pragmatic aspects of whether targets would be achievable. Whilst it was identified in the NAQS that the objectives for benzene, 1,3-butadiene, lead (Pb) and carbon monoxide (CO) could be achieved as a result of improvement measures already put in place, complying with targets for NO₂ and PM₁₀ would be more difficult.
- 2.10 Considering the additional measures that would have to be introduced to counter these apparent shortfalls, the Government voiced the following thought:

“Changes in planning and transport policies (are needed) which would reduce the need to travel and reliance on the car”. Regarding the necessity for encouraging a shift away from private car usage, the Strategy commented, in terms of the new package approach to transport funding:

“As a general rule, traffic demand management and restraint measures should be included and this, together with proposals to promote and enhance other modes of transport, should aim to achieve modal shifts away from the private car.”

** DfT Statistics - Vehicle Licensing Statistics: Annual 2022)



- 2.11 The Environment Act 1995 sections 82-84 requires that Local Authorities shall carry out reviews of air quality within their administrative areas and, where it is assessed that the air quality objectives may not be complied with in the future, an Air Quality Management Area (AQMA) must be declared. The Local Authority must then formulate an Action Plan, setting out the measures that will be employed to achieve compliance with the objectives.
- 2.12 A review of the UK Air Quality Strategy was undertaken in 1998 and a consultation document was published in January 1999 which outlined proposals for amending the Strategy. In August 1999, in response to the consultation, the Government then published a draft Air Quality Strategy for England, Scotland, Wales and Northern Ireland. The Air Quality Regulations (England) 2000 were enacted in April 2000, and the Air Quality (England) (Amendment) Regulations 2002 gives legal force to the air quality standards set out in the Strategy. A new strategy was released in July 2007 with various amendments to the air quality objectives. The proposals, in brief, consisted of recommendations to adopt the provisions of the EU Air Quality Daughter Directives. The National Air Quality Objectives (NAQO's) included in the Regulations are set out in Appendix 2.
- 2.13 Given the significant influence that motor vehicle exhausts exert on air quality in the UK and the apparent links between elevated levels of certain air pollutants and premature mortality, current and emerging Government policy is geared towards several essential objectives, which are:
- continued action to reduce pollutant emissions from vehicles across the EU, which can be exemplified by the plethora of Directives concerning limitation of motor vehicle emissions since the 1970's and specific targeted initiatives such as the Auto-Oil Study programme;
 - concerted action at a National level to reduce private car trips in urban and inter-urban uses and encourage use of alternative forms of transportation;
 - action at a local level to manage transportation and air quality in order to reduce the number of car trips in urban areas specifically and to aim for compliance with the NAQS by the appointed dates; and
 - to ensure that Local Authorities in the execution of their development control responsibilities take account of the consequent air quality impacts.



- 2.14 It is evident that continued growth in private car ownership and usage will result in further deterioration of air quality in urban areas and increasing emissions of greenhouse gases. Whilst current technological improvements will extend the reduction in emissions, additional measures will be required in order to prevent re-growth of emissions, both to meet ambient air quality targets in urban areas and to offer an alternative to the car for urban journeys. Consequently, where new development can be in close proximity to public transport and local services, a contribution to the UK's target of reducing emissions will have been made.
- 2.15 Levels of lead (Pb) and sulphur dioxide (SO₂) are also controlled by the NAQO. Lead levels have reduced significantly since its reduced use as a fuel additive, and the abolition of four-star petrol in January 2000 means that the amount of Pb in petrol is reduced to a negligible level. SO₂ is predominantly associated with emissions from industrial processes and when assessing the effects of traffic, neither SO₂ nor Pb need be assessed.

National Planning Policy Framework

- 2.16 Paragraphs 192 to 194 of the NPPF (NPPF – December 2023) is considered relevant to this assessment:

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

193. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). 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.

194. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”.

Planning Practice Guidance (PPG)

- 2.17 The Planning Practice Guidance (PPG) provides guidance on the policy governing Environmental Impact Assessment of air quality and the process by which Environmental Impact Assessment is carried out. The PPG states:

“The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:

- fine particulate matter (PM_{2.5})
- ammonia (NH₃)
- nitrogen oxides (NO_x)
- sulphur dioxide (SO₂)
- non-methane volatile organic compounds (NMVOCs)

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity.”

The Environment Act 2021

- 2.18 The Environment Act was passed into UK law in November 2021 with the aim of protecting and enhancing the environment for future generations. The Act establishes the Office for Environmental Protection (OEP), the new green watchdog for England (and Northern Ireland), which will be responsible for



'holding to account' government and public bodies on their environmental obligations.

2.19 Amongst other things, the Act introduced a duty on the government to bring forward at least two air quality targets by October 2022, which were set in secondary legislation. The first aim was to reduce the annual average level of fine particulate matter (PM_{2.5}) in ambient air. The second was a long-term target (set a minimum of 15 years in the future).

2.20 The Environment Improvement Plan 2023 (First revision of the 25 Year Environment Plan) reiterated the ambition to reduce PM_{2.5} concentrations in the future. The Plan sets the following long-term and interim targets.

Long-term targets;

- *"By the end of 2040, we will achieve a maximum Annual Mean Concentration Target (AMCT) of 10 micrograms of PM_{2.5} or below per cubic metre (µgm⁻³); and*
- *By the end of 2040, we will reduce population exposure to PM_{2.5} by 35% compared to 2018 levels".*

Interim targets:

"By the end of January 2028:

- *The highest annual mean concentration in the most recent full calendar year must not exceed 12 µgm⁻³ of PM_{2.5}.*
- *Compared to 2018, the reduction in population exposure to PM_{2.5} in the most recent full calendar year must be 22% or greater".*

Additional Guidance

2.21 The Local Air Quality Management Technical Guidance LAQM.TG(22) (August 2022 update) is designed to support local authorities in carrying out their duties under the Environment Act 1995. These duties require local authorities to periodically review and assess air quality in their area.

2.22 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS, 2007) sets out air quality objectives and policy options to further improve air quality in the UK. It provides options which are intended to provide important benefits to UK Air Quality.

The effects of dust generation from construction will be assessed at the detailed AQA in accordance with the methodology presented in the



Institute of Air Quality Management (IAQM) publication “Guidance on the assessment of dust from demolition and construction” (2024).”

Local Council Policy

Horsham District Planning Framework: Preferred Strategy (August 2013)

- 2.23 The Horsham District Planning Framework: Preferred Strategy is the overarching planning document for Horsham district and was adopted in August 2013. The strategy alludes specifically to environmental quality and makes reference to air quality by stating:

“In recent years, monitoring of air quality in the District has revealed that some areas have high levels of nitrogen dioxide, which can cause health problems. In Storrington and Cowfold the level of this air pollutant has been high enough to require the designation of Air Quality Monitoring Areas (AQMAS). The primary cause of high nitrogen dioxide levels in the District is from vehicle emissions, and the impact of development on transport levels and air quality is therefore a key consideration for the Local Plan’.

- 2.24 Within the framework, Policy 24 relates directly to Air Quality and states:

“Strategic Policy: Environmental Protection

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 noise, odour, air and light pollution and ensure that they:

1. Address land contamination by promoting the appropriate re-use of sites and requiring the delivery of appropriate remediation;
2. Are appropriate to their location, taking account of ground conditions and land instability;
3. Maintain or improve the environmental quality of any watercourses, groundwater and drinking water supplies, and prevents contaminated run-off to surface water sewers;
4. Minimise the air pollution and greenhouse gas emissions in order to



protect human health and the environment;

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

6. 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

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



3.0 METHODOLOGY AND ASSESSMENT CRITERIA

Assessment of the Prevailing Air Quality

3.1 This section summarises the methodology used to consider whether there are “Significant” air pollution impacts on sensitive receptors or constraints on development. To determine the extent to which air quality issues will affect the sensitive receptors, the study has considered the following:

- Any air quality measurements carried out in Horsham District (which are in the public domain);
- The Review and Assessment of air quality carried out by HDC for the area, as submitted to the Department for the Environment, Food and Rural Affairs (DEFRA);
- Predictions of air pollutant concentrations adjacent to the site;
- The predictions have been carried out utilising the ADMS Roads dispersion modelling program.

Assessment Criteria

- 3.2 The NAQO levels are derived from air quality standards set to protect health. The objectives address social and economic factors as well as the health standards.
- 3.3 For the purposes of this development proposal, the NAQO will form the basis of the air quality assessment. The NAQO levels are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether the air quality in the vicinity of a road is likely to be detrimental to human health. In determining whether air pollutant levels may constrain development, the results of the study have been compared against the acceptability criteria.
- 3.4 The effects of dust generation from construction have been undertaken following the methodology presented in the Institute of Air Quality Management (IAQM) publication “Guidance on the assessment of dust from demolition and construction” (2023).
- 3.5 In determining whether air pollutant levels may constrain development, the results of the study have been compared against the acceptability criteria.



Impact Magnitude and Impact Descriptors (Significance) – Air Quality Assessments

Construction Phase

3.6 During the construction phase, there will be several activities undertaken that have the potential to generate and/or re-suspend dust and PM₁₀. At the time of assessment, the exact activities to be undertaken during construction are unknown. However, to evaluate the magnitude and extent of potential adverse impacts likely to result from the proposed development, the following construction activities have been assumed:

- storage of materials;
- laying of hard surfaces;
- construction of buildings;
- vehicle movements to and from the Site.

3.7 The magnitude of the potential impacts of a construction site on air quality is mainly determined by its size, the range of activities undertaken across the site, proximity to sensitive receptors, complexity of terrain and any barriers between sources and receptors.

3.8 A qualitative assessment of the potential impacts during construction has been undertaken using information in guidance documents produced by IAQM.

3.9 According to this guidance; a human receptor refers to any location where a person may experience the annoyance effects of airborne dust or dust soiling, or exposure to PM₁₀ over a time relevant to the air quality objectives. In terms of annoyance effects, this will most commonly relate to residential dwellings and schools.

3.10 Activities on construction sites can be divided into four types to reflect their different potential impacts, with the potential for dust emissions to be assessed only for each activity taking place:

- Demolition;
- earthworks;
- construction; and
- trackout.

3.11 The assessment methodology considers three separate dust effects:

- annoyance due to soiling;
- harm to ecological receptors; and



- the risk of health effects due to a significant increase in exposure to PM₁₀.
- 3.12 Account is also to be taken of the distance of the receptors that may experience these effects. The assessment procedure assumes no mitigation measures are applied except those required by legislation.
- 3.13 The potential dust emission magnitude for the proposed Development Site is determined for the four construction activities using the criteria presented in IAQM guidelines. The magnitude is based on the scale of the anticipated works and classified as “Small”, “Medium” or “Large”.
- 3.14 The “Sensitivity of an Area” to dust soiling effects on people and property is determined by using the criteria presented in **Table 3.1**. The “Sensitivity of an Area” to human health impacts is presented in **Table 3.2**. The “Sensitivity of an Area” and to ecological impacts is presented in **Table 3.3**.

Table 3.1: 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
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low



Table 3.2: Sensitivity of the area to human health impacts

Receptor Sensitivity	Annual Mean PM ₁₀ conc.	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 μgm^{-3} (>18 μgm^{-3} in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 μgm^{-3} (16-18 μgm^{-3} in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 μgm^{-3} (14-16 μgm^{-3} in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 μgm^{-3} (<14 μgm^{-3} in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 μgm^{-3} (>18 μgm^{-3} in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 μgm^{-3} (16-18 μgm^{-3} in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 μgm^{-3} (14-16 μgm^{-3} in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 μgm^{-3} (<14 μgm^{-3} in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>=1	Low	Low	Low	Low	Low

Table 3.3: 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

3.15 As the potential dust emissions magnitude and the sensitivity of the area have been determined the results can be combined to define the risks of impact using the criteria in the following tables.



Table 3.4: Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	<i>Large</i>	<i>Medium</i>	<i>Small</i>
<i>High</i>	High Risk	Medium Risk	Medium Risk
<i>Medium</i>	High Risk	Medium Risk	Low Risk
<i>Low</i>	Medium Risk	Low Risk	Negligible

Table 3.5: Risk of Dust Impacts – Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	<i>Large</i>	<i>Medium</i>	<i>Small</i>
<i>High</i>	High Risk	Medium Risk	Medium Risk
<i>Medium</i>	Medium Risk	Medium Risk	Low Risk
<i>Low</i>	Medium Risk	Low Risk	Negligible

Table 3.6: Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	<i>Large</i>	<i>Medium</i>	<i>Small</i>
<i>High</i>	High Risk	Medium Risk	Medium Risk
<i>Medium</i>	Medium Risk	Low Risk	Low Risk
<i>Low</i>	Medium Risk	Low Risk	Negligible

- 3.16 The proposed development's site-specific results and significance of these tables are discussed in Section 5 of this Report.

Operational Phase

- 3.17 The impact of local traffic growth, development generated traffic and other potential sources of air pollution have been assessed for the magnitude of change and for the extent to which change in air quality from existing to future levels would be significant.
- 3.18 Descriptors for the magnitude of change in annual mean concentrations of NO₂ and PM₁₀ and the number of days with PM₁₀ concentrations greater than 50 µgm⁻³ are presented in **Table 3.7**.

Table 3.7: Descriptors for the magnitude in changes in annual mean concentrations of NO₂ and PM₁₀ and the number of days with PM₁₀ concentrations greater than 50 µgm⁻³

Magnitude of Change	Annual Mean NO ₂ /PM ₁₀	Days PM ₁₀ >50 µgm ⁻³
Large	Increase/decrease >4 µgm ⁻³	Increase/decrease >4 days
Medium	Increase/decrease 2 - 4 µgm ⁻³	Increase/decrease 2 - 4 days
Small	Increase/decrease 0.4 - 2 µgm ⁻³	Increase/decrease 1 - 2 days
Imperceptible	Increase/decrease <0.4 µgm ⁻³	Increase/decrease <1 day



3.19 Following on from the determination of the magnitudes of the impact of change of NO₂ and PM₁₀ levels, the assessment of the significance of the impact with reference to the NAQO Levels can be undertaken. Descriptors of the changes to annual mean concentrations of NO₂ and PM₁₀ and the number of days with PM₁₀ concentrations greater than 50 µgm⁻³ are presented in **Table 3.8**.

Table 3.8: Impact descriptors for changes to annual mean concentrations of NO₂ and PM₁₀ and the number of days with PM₁₀ concentrations greater than 50 µgm⁻³

<i>Absolute Concentration in Relation to Objective/Limit Value</i>	Change in Concentration /Number of Days		
	<i>Small</i>	<i>Medium</i>	<i>Large</i>
Increase with Scheme			
Above Objective/Limit Value With Scheme (>40 µgm ⁻³ / >35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36-40 µgm ⁻³ / >32-35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30-36 µgm ⁻³ / >26-32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µgm ⁻³ / <26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value Without Scheme (>40 µgm ⁻³ / >35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value Without Scheme (36-40 µgm ⁻³ / >32-35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value Without Scheme (30-36 µgm ⁻³ / >26-32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value Without Scheme (<30 µgm ⁻³ / <26 days)	Negligible	Negligible	Slight Beneficial
Note – an “Imperceptible” change would be described as “Negligible”			

3.20 Table 3.7 and Table 3.8 detail the magnitude and “Significance” of changes in NO₂ and PM₁₀ levels. The tables have been extracted from the Environmental Protection UK (formerly National Society for Clean Air (NSCA)) publication “*Development Control: Planning for Air Quality (2010 Update)* – Table 5 and Appendix 3”.



Traffic Data

Road Traffic

- 3.21 The future concentrations of NO_x, NO₂ and PM₁₀ at the Southwater diffusion tube, the continuous air quality monitor in Horsham and a selection of local sensitive receptors have been predicted using the ADMS Roads dispersion model based on forecast traffic flows for the local road network.
- 3.22 Two “Base” (Do Nothing) and one “Future” (Do Something) scenarios have been assessed along with a 2019 scenario for the verification of the model. The base scenarios are 2024 and 2028 and the future scenario is 2028 + Development.
- 3.23 Development generated road traffic data was provided by WPS. Road traffic data has been gathered using permanent ATC, the Department for Transport (DfT) website and WEBTRIS and where road traffic data was not available, this has been obtained from HDC.
- 3.24 The collected traffic flows have been growthed from the base year to the assessment years using TEMPRO and NTM. Committed development generated traffic has been added to the base year traffic flows to provide a “Future” year scenario. Where 24hr AADT flows were not available, existing traffic proportions on the highway network have been used to growth the available traffic data.
- 3.25 The “Base” scenario vehicle flows on the local highway network used in the assessment are detailed in **Table 3.9**.



Table 3.9: AADT Traffic flow data (no development generated traffic) 2024

Link Ref.	Description	AADT Two Way
1	A24 North RB	23033
2	A24 North Worthing Road	33830
3	A24 South Mill Strainght NB	16573
4	A24 South Mill Strainght SB	16573
5	A24 South RB	18732
6	A24 South Worthing Road	32462
7	Church Lane East	2684
8	Church Lane West	2684
9	Mill Straight	6067
10	Southwater Street	2018
11	Worthing Road North A24	12215
12	Worthing Road North of Site Access	12243
13	Worthing Road North of Church Lane	8471
14	Worthing Road North of Southwater	9551
15	Worthing Road South of Site Access	9159
16	Worthing Road South of Church Lane	7030

- 3.26 The local highway network has been modelled as distinctive links where vehicle speeds change, width of roads change, and at roundabout junctions. Also included are changes in vehicle speed due to pedestrian crossings and traffic lights.

Background Concentrations of Air Pollutants

- 3.27 Background concentrations of air pollutants for the dispersion modelling were obtained from the UK National Air Quality Information Archive (DEFRA website), in accordance with Local Air Quality Management Technical Guidance TG (22). Data sets for 2018- based background maps for years 2018- 2030 have been published by DEFRA. Identified in **Table 3.10** are the background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} for the years 2024 and 2028.



Table 3.10 : Background pollutant concentrations for 2024 and 2028

Grid Reference		2024				2028			
<i>Easting</i>	<i>Northing</i>	<i>NO_x</i>	<i>NO₂</i>	<i>PM₁₀</i>	<i>PM_{2.5}</i>	<i>NO_x</i>	<i>NO₂</i>	<i>PM₁₀</i>	<i>PM_{2.5}</i>
517500	130500	15.30	11.23	13.97	9.44	13.25	10.05	13.56	9.33
515500	126500	9.96	7.56	13.23	8.56	8.79	6.87	12.58	8.45



4.0 BASELINE CONDITIONS

Air Quality Review and Assessment

- 4.1 As previously indicated, Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to comply with the NAQO. In areas where these objectives are unlikely to be achieved, local authorities must designate these areas as Air Quality Management Areas (AQMA's) and prepare a written Action Plan to achieve the NAQO.
- 4.2 The review of air quality takes on several prescribed stages, of which each stage is reported. The review and assessment of air quality is the responsibility of Horsham District Council (HDC).
- 4.3 HDC declared two AQMA's in 2010/2011 for exceedances of annual mean concentrations of NO₂ within its administrative boundary. The first AQMA (Horsham AQMA No. 1) covers the area of West Street, the High Street, and part of School Hill and Manleys Hill, Storrington, which was declared in December 2010.
- 4.4 The second AQMA (Cowfold AQMA) covers an area along The Street, part of Station Road and Bolney Road. Refer to Appendix 2 for the location of the two AQMA's.
- 4.5 From the Annual Status Report (ASR) undertaken in 2023 by HDC, the development site is not located in an AQMA. However, development generated traffic does have the potential to impact on the AQMA's.

Air Quality Monitoring

Continuous Monitoring

- 4.6 HDC operates three continuous monitoring sites within their administrative boundary, which are:
- HO2 Horsham Park Way (junction of Park Street and Park Way in Horsham);
 - HO4 Storrington AURN (junction of Manley's Hill and Meadowside in Storrington; and
 - HO5 Cowfold (Bolney Road/The Street, Cowfold).
- 4.7 Triplicate tubes have been maintained at all three automatic analyser sites.



4.8 Presented in **Table 4.1** are recorded concentrations of NO₂ available for 2018 to 2022 at Horsham Continuous Monitor (CM) and where concentrations are at or above the NAQO level the cells have been shaded light grey. The results from HO2 have been used to verify the ADMS Roads model.

Table 4.1: Measured Annual Mean NO₂ Concentrations (µg/m³) - CM

Site ID	Location	Within AQMA?	Annual mean concentrations (µg/m ³)				
			2018	2019	2020	2021	2022
HO2	Horsham Park Way	No	25.4	24.4	18.8	21.1	17.7

4.9 Presented in **Figure 4.1** are the annual trends in NO₂ concentrations since 2018 at the continuous monitoring sites HO2, HO4 and HO5.

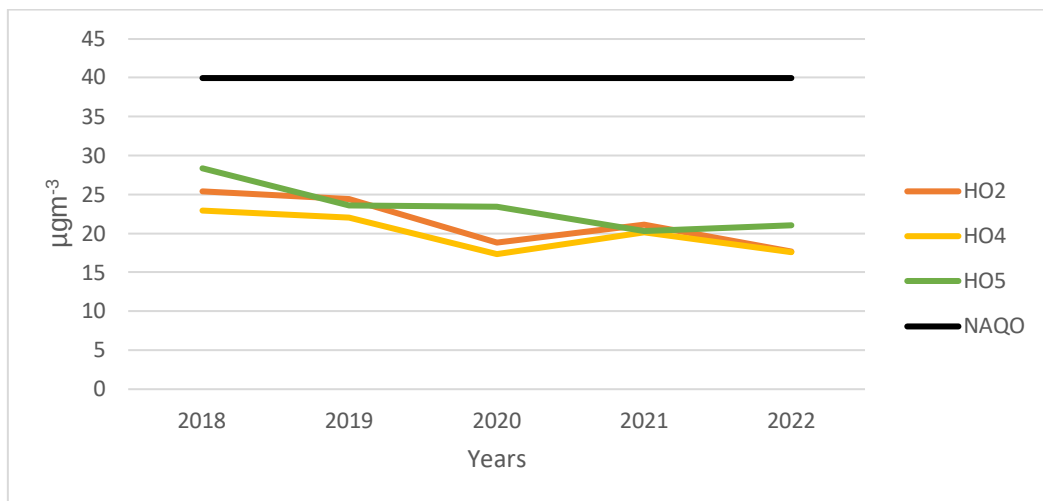


Figure 4.1: Trends in annual mean NO₂ concentrations at automatic monitoring sites HO2, HO4 and HO5 2018 - 2022

4.10 With reference to Figure 4.1, the recorded concentrations are well below the NAQO level of 40 µgm⁻³.

Passive Monitoring - Diffusion Tubes

4.11 HDC also operates a network of non-automatic (passive) monitoring sites within the district and at the end of 2022 there were 49 active sites monitoring NO₂ via diffusion tube (DT). It should be noted that there are three DT co-located at HO2, HO4 and HO5 continuous monitors.

4.12 The DT locations within Horsham district are a mixture of “Urban Background”, “Roadside” and “Kerbside” concentrations. The closest DT to the development site is Southwater 1 (Site ID – DT49) which records “Roadside” concentrations, which is located on Worthing Road, opposite Southwater Infant Academy. The

DT is approximately 560m north-east of the boundary of the proposed site. Refer to **Figure 4.2** for the location of DT49.

Figure D.7 – Map of Southwater Monitoring Site

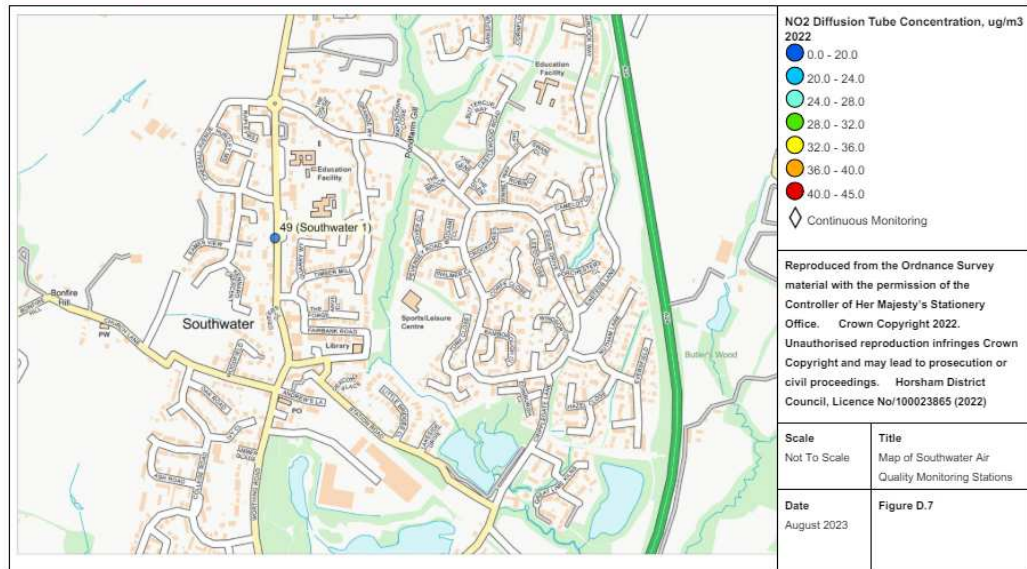


Figure 4.2: Non-Automatic (DT) Monitoring Site in Southwater – DT49 (Ref. HDC ASR 2023 Figure D.7)

4.13 Presented in **Table 4.2** are recorded concentrations of NO₂ available for 2017 and 2018.

Table 4.2: Measured Annual Mean NO₂ Concentrations (µg/m³) - DT

Site ID	Location	Within AQMA?	Annual mean concentrations (µg/m ³)				
			2018	2019	2020	2021	2022
49	Southwater 1	No	27.3	23.5	21.1	21.7	19.4

4.14 With reference to Table 4.2, at DT49, annual mean concentrations of NO₂ were below the NAQO level of 40 µg/m³ up to the end of 2022.

4.15 Presented in **Figure 4.3** are the annual trends in NO₂ concentrations since 2018 at the non-automatic (passive) monitoring site 49.

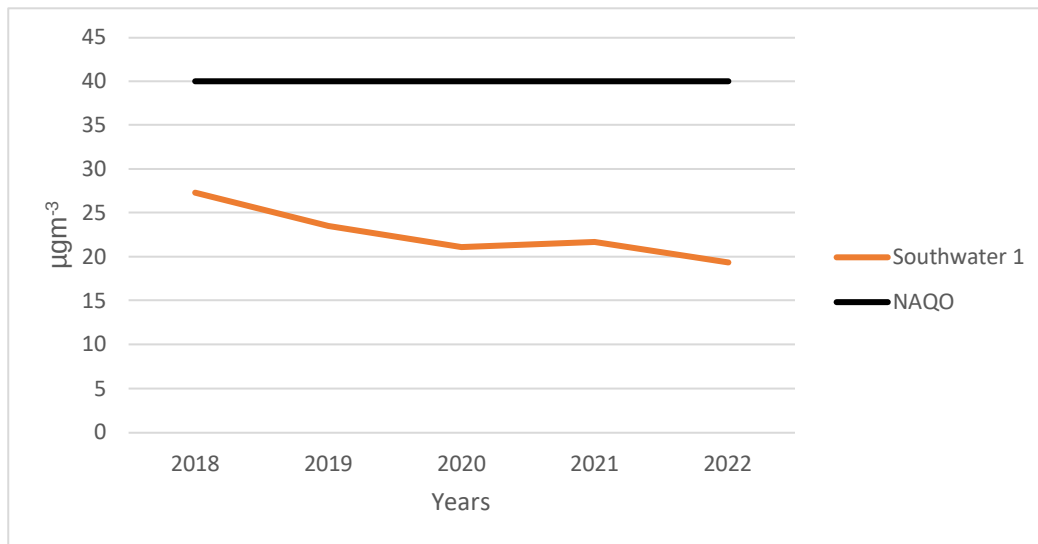


Figure 4.3: Trends in annual mean NO₂ concentrations at non-automatic (passive) monitoring site 49 2018 - 2022

- 4.16 With reference to Figure 4.3, concentrations of NO₂ at DT49 have been well below the NAQO level of 40 µg/m³.
- 4.17 Concentrations of PM₁₀ are recorded at HO2 and concentrations up to the end of 2022 have been 19.6 µg/m³ in 2018, 19.3 µg/m³ in 2019, 15.7 µg/m³ in 2020, 17.5 µg/m³ in 2021 and 19.3 µg/m³ in 2022. It should be noted that concentrations are below the current NAQO level of 40 µg/m³ for PM₁₀ and below the proposed NAQO level of 20 µg/m³ since 2018.
- 4.18 Presented in **Figure 4.4** are the annual trends in PM₁₀ concentrations since 2007 at the continuous monitoring sites.

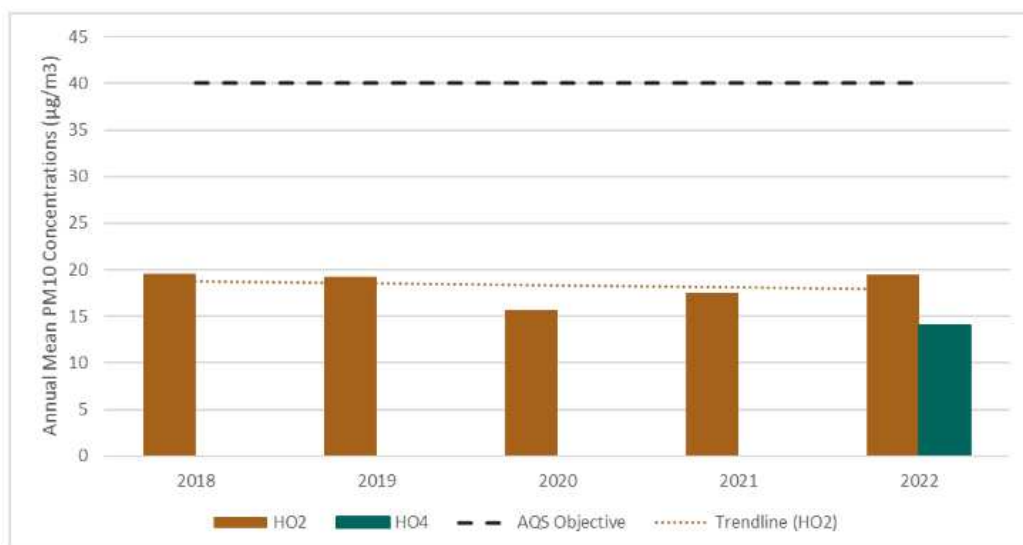


Figure 4.4: HDC ASR 2023 - Fig A.7 – Trends in annual mean PM₁₀ concentrations (µg/m³) measured at the automatic monitoring site 2018 – 2022



- 4.19 From Figure 4.4, the recorded concentrations of PM₁₀ are well below the NAQO level of 40 µgm⁻³.

Dispersion Modelling – ADMS Roads

- 4.20 The existing and future concentrations of pollutants within the assessment area for all scenarios have been modelled using ADMS Roads. The software is PC based and models the release of pollutants from road sources into the atmosphere.
- 4.21 Meteorological data for 2019 was obtained from ADM Ltd. Gatwick Airport is the most representative observation station for the development site. The met data has been used for the verification of the model, base modelling and future years and a wind rose for 2019 is presented in **Appendix 4**.
- 4.22 Background pollutant concentrations for the kilometre squares covering the assessment area were obtained from the Defra website and the concentrations for 2019 and 2025 are presented in Table 3.10. However, when the DEFRA concentrations of NO₂ and PM₁₀ were compared with local background/suburban concentrations, they were considerably lower. Therefore, locally derived background concentrations were used for the modelling.

Model Verification

- 4.23 Model verification has been undertaken using the guidance provided in LAQM.TG (22). The process requires the comparison of the monitored roadside contribution of NO₂ with the modelled roadside contribution of NO₂. The site type definitions have been taken from HDC's 2023 ASR.
- 4.24 Within the assessment area there is one automatic monitoring site and one diffusion tube (refer to previous paragraphs). ADMS Roads has been used to calculate NO_x and NO₂ concentrations for 2019 which have been verified against the recorded NO₂ and NO_x levels at HO2 and DT49 for 2019. The results from the monitoring and the ADMS Roads modelling are presented in **Table 4.3**.



Table 4.3: Comparison of the monitored (CM and DT) and unadjusted modelled (ADMS Roads) concentrations of NO₂

Site ID	Monitor Type	Site Type	Site Description	Background NO ₂	2019 Monitored NO ₂	2019 Modelled NO ₂	Difference [(monitored - modelled)/monitored] x100 (%)
HO2	CM	R	Horsham Park Way	13.09	24.4	16.21	33.6
DT49	DT	R	Southwater 1	8.82	23.5	14.81	37.0

4.25 From Table 4.3 it can be seen that both receptors are under predicting by between 33.6% and 37.0%.

4.26 Within TG (22) there is guidance on how to apply an adjustment factor to the road contribution NO_x to reduce the inaccuracy of the results from the modelling. Using the TG(22) 'Boxes 7-17 to 7-19' method, the modelled road contribution NO_x is not predicting an accurate contribution of NO_x to the overall contribution. Therefore, a correction factor will need to be applied to the modelled road contribution NO_x to bring it to within comparable levels with the monitored data.

4.27 A Road-NO_x adjustment factor of 1.8426 was determined as the slope of the best fit between the 'measured' road contribution and 'modelled' road contribution NO_x, forced through zero.

4.28 Presented in **Table 4.4** is the comparison of the monitored NO₂ concentrations and the adjusted ADMS Roads modelled NO₂ concentrations.

Table 4.4: Comparison of the monitored (CM and DT) and the adjusted modelled (ADMS Roads) concentrations of NO₂

Site ID	Monitor Type	Site Type	Site Description	Background NO ₂	2019 Monitored NO ₂	2019 Adjusted Modelled NO ₂	Difference [(monitored - modelled)/monitored] x100 (%)
HO2	CM	R	Horsham Park Way	13.09	24.4	25.77	5.61
DT49	DT	R	Southwater 1	8.82	23.5	21.37	-9.06

Pollutant Concentrations

- 4.29 To characterise the air pollutant concentrations adjacent to the roads that would be affected by the proposed development traffic, predictions have been made at the CM, the DT and six sensitive receptors adjacent to local roads.
- 4.30 Refer to **Figure 4.5** for the sensitive receptors adjacent to the site access and the roads in Southwater which will be impacted by development generated traffic.

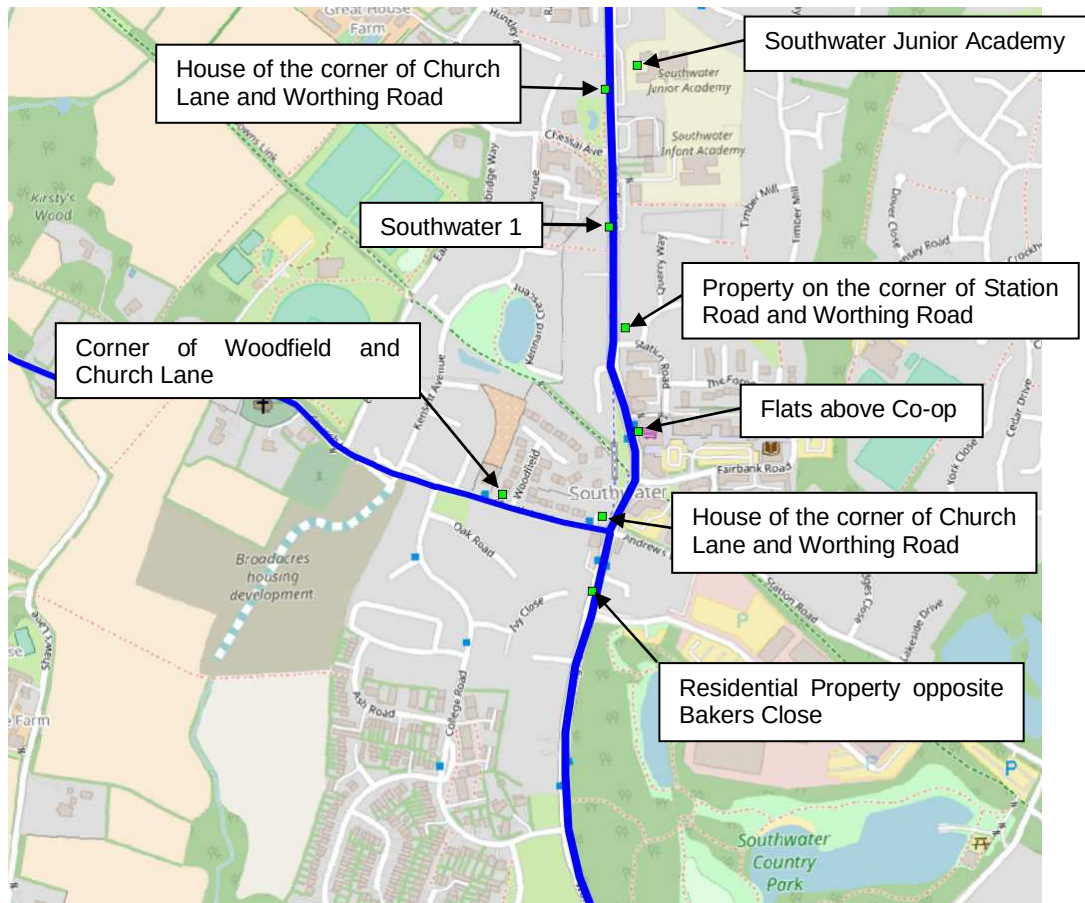


Figure 4.5: Receptor Location Plan

- 4.31 The predictions have been undertaken for the 'Base Year' 2024 and the future 'Base Year' 2028. All scenarios have been assessed using ADMS Roads dispersion modelling.
- 4.32 Background concentrations for future assessments years have been kept the same as the Verification year 2019. The reason for using the base year background concentrations is due to recorded local concentrations of NO₂ not decreasing significantly as predicted over the past five years, and a worst-case scenario has therefore been modelled.
- 4.33 The results of the predictions are presented in Table 4.5.



Table 4.5: Predicted Air Quality Concentrations at Sensitive Receptors 2024

Receptor Number and Name		NO _x	NO ₂	PM ₁₀		PM _{2.5}
		Annual mean µgm ⁻³	Annual mean µgm ⁻³	Annual mean µgm ⁻³	Days >50 µgm ⁻³	Annual mean µgm ⁻³
HO2	HO2	32.4	20.7	15.8	0.3	10.8
R1	House of the corner of Church Lane and Worthing Road	22.7	15.6	15.1	0.1	10.5
R2	Flats above Co-op	26.3	17.5	15.3	0.2	10.6
R3	Property on the corner of Station Road and Worthing Road	23.5	16.0	15.1	0.1	10.5
R4	Corner of Woodfield and Church Lane	19.4	13.9	14.9	0.1	10.3
R5	Southwater Junior Academy	20.4	14.4	15.0	0.1	10.4
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	25.7	17.2	15.3	0.2	10.5
R7	Residential Property opposite Bakers Close	24.0	16.3	15.2	0.1	10.5
Southwater 1	DT49	28.0	18.5	15.4	0.2	10.6
NAQO		-	40	40	35	25

4.34 When the pollutant concentrations in Table 4.5 are compared to the NAQO, it can be seen that concentrations of NO₂ and PM₁₀ are predicted to be well below the level of 40 µgm⁻³ and the number of days when the concentration of PM₁₀ is greater than 50 µgm⁻³ is well below 35 days. It can also be seen that the concentrations of PM_{2.5} are well below 25 µgm⁻³.



5.0 AIR QUALITY ASSESSMENT

- 5.1 The assessment has been split into two parts, the potential “Impacts” of development generated traffic and construction activities and the “Constraints” on the development.
- 5.2 The “Impact” section of the assessment assesses whether development generated traffic flows on the highway network are likely to result in a significant change in annual mean concentration of NO₂ and PM₁₀ at sensitive off-site receptors. Also assessed are the potential dust impacts and PM₁₀ changes on sensitive receptors.
- 5.3 The “Constraints” part of the assessment compares the predicted concentration of NO₂ and PM₁₀ within the development site against NAQO levels and assesses whether predicted levels within the site are above the objective levels.

Impacts

Dust Assessment: Predicted Construction Impacts

- 5.4 The main sources of dust and PM₁₀ during construction activities are:
- Haulage routes, vehicles and construction traffic;
 - Materials handling, storage, stockpiling, potential spillage and disposal;
 - Exhaust emissions from site plant;
 - Site preparation;
 - Construction and fabrication processes; and
 - Internal and external finishing and refurbishment.
- 5.5 The majority of the releases are likely to occur during the typical “working-week”. The construction impact assessment has been split into two sections. The first deals with the potential impacts from dust soiling and changes in PM₁₀ concentrations due to on-site works and the second deals with the effect of emissions from construction traffic.

Dust soiling and changes in PM₁₀ concentrations

- 5.6 The site will require earthworks, construction and trackout of vehicles associated with all phases of the Site. The resulting dust emission magnitudes are:
- Earthworks – **Large** (Total site area >10,000 m², moderately dusty soil type, 5-10 heavy earth moving vehicles active at any one-time, total material moved greater than 100,000 tonnes);



- Construction – **Large** (Total building volume is greater than 100,000 m³, on site concrete batching);
- Trackout – **Medium** (10-50 HGV outward movements in any one day, moderately dusty surface material).

5.7 Using the information presented in Section 3 and the criteria presented in Table 3.1, Table 3.2 and Table 3.3, the sensitivity of the construction for the proposed development can be defined. The results of defining the sensitivity of the area are presented in **Table 5.1**.

Table 5.1: Outcome of Defining the Sensitivity of an Area

Potential Impact	Sensitivity of the Surrounding Area			
	<i>Demolition</i>	<i>Earthworks</i>	<i>Construction</i>	<i>Trackout</i>
Dust Soiling	N/A	Medium	Medium	Medium
Human Health	N/A	Low	Low	Low
Ecological	N/A	Negligible	Negligible	Negligible

5.8 From Table 5.1 it can be seen that the predicted sensitivity of the surrounding area to dust soiling is “Medium” during the earthworks and construction phases and during trackout. The sensitivity of the surrounding area to changes in PM₁₀ affecting human health is “Low” during the construction and earthworks phase and during trackout. As there are no ecological receptors within 50m of the development, the predicted sensitivity impact is “Negligible”.

5.9 The dust emission magnitude determined in paragraph 5.6 is combined with the sensitivity of the area summarised in Table 5.1 to determine the risk of impacts with no mitigation applied. The risk of impacts are summarised in **Table 5.2**.

Table 5.2: Summary Dust Risk Table to Define Site-Specific Mitigation

Potential Impact	Risk			
	<i>Demolition</i>	<i>Earthworks</i>	<i>Construction</i>	<i>Trackout</i>
Dust Soiling	N/A	Medium	Medium	Low
Human Health	N/A	Low	Medium	Low
Ecological	N/A	Negligible	Negligible	Negligible

5.10 During the Earthworks phase of development, there is a Medium Risk of annoyance caused by dust soiling and a Low Risk of health effects due to increase exposure in PM₁₀.



- 5.11 During the Construction phase of development, it has been assessed that there is a Medium Risk of potential annoyance to people and property caused by dust soiling and a Medium Risk of health effects due to an increase exposure in PM₁₀. Therefore, mitigation may be required.
- 5.12 Throughout the Trackout processes, there is a Low Risk of dust soiling and human health effects due to an increase exposure in PM₁₀.
- 5.13 For those cases where the risk category is Negligible (i.e. ecological), no specific mitigation measures is required beyond specific legislation.

Predicted Operational Impacts

- 5.14 The air quality impact of the proposed development on the surrounding area has been assessed by considering the changes in traffic flows which will occur on the existing highway network with the development in place.
- 5.15 Potential impacts from the proposed development would occur following the opening of Phase 5 of the proposed development in 2028. Therefore, the year of assessment is 2028 “Do Nothing” and “Do Something”. For this development a Transport Assessment (TA) has been undertaken by WSP and part of the assessment was the collection and analysis of road traffic data from automated traffic counts (ATC), and the proposed development.

Traffic Generation –2028 with Phase 5 development

- 5.16 Development generated road traffic data for 2028 on the local highway network has been provided by WSP. The “Base” traffic flows have been growthed using TEMPRO and NTM, which considers traffic from Committed Development projects. Phase 5 development generated traffic has then been added to the 2028 traffic flows and a summary is presented in **Table 5.3**.



Table 5.3: Changes in traffic flow “with” and “without” Phase 5 of the development in 2028

Link Ref.	Description	2025 AADT	
		“do nothing”	“do something”
1	A24 North RB	24564	24850
2	A24 North Worthing Road	35943	36335
3	A24 South Mill Straight NB	16841	16880
4	A24 South Mill Straight SB	16841	16880
5	A24 South RB	19291	19386
6	A24 South Worthing Road	33308	33448
7	Church Lane East	4677	5073
8	Church Lane West	4677	5073
9	Mill Straight	6909	7071
10	Southwater Street	2059	2065
11	Worthing Road North A24	12930	13062
12	Worthing Road North of Site Access	14691	15168
13	Worthing Road North of Church Lane	10549	10956
14	Worthing Road North of Southwater	11987	12464
15	Worthing Road South of Site Access	11159	11550
16	Worthing Road South of Church Lane	8002	8190

5.17 From Table 5.3 it can be seen that, with the completion of Phase 5 of the development, there is predicted to be an increase of between 0.2% and 8.4% in 24 hour traffic flows along the links within the assessment area. The greatest predicted change in traffic flows are on Church Lane (East and West of Site Access) (adjacent to the Site).

ADMS Roads Assessment – 2028 with Phase 5 development

5.18 Sensitive receptors adjacent to the development site and where there is predicted to be an impact from the development have been assessed for the two scenarios, “do nothing” and “do something”. The results from the assessment are presented in **Table 5.4** and **Table 5.5**.



**Table 5.4: Predicted air quality concentrations at sensitive receptors in 2028
“Do Nothing”**

Receptor Number and Name		NO _x	NO ₂	PM ₁₀		PM _{2.5}
		Annual mean µgm ⁻³	Annual mean µgm ⁻³	Annual mean µgm ⁻³	Days >50 µgm ⁻³	Annual mean µgm ⁻³
HO2	HO2	26.9	17.8	15.8	0.2	10.8
R1	House of the corner of Church Lane and Worthing Road	20.9	14.7	15.2	0.1	10.5
R2	Flats above Co-op	23.4	15.9	15.4	0.2	10.6
R3	Property on the corner of Station Road and Worthing Road	21.4	14.9	15.2	0.1	10.5
R4	Corner of Woodfield and Church Lane	18.7	13.5	15.0	0.1	10.4
R5	Southwater Junior Academy	19.3	13.8	15.0	0.1	10.4
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	23.0	15.7	15.3	0.2	10.6
R7	Residential Property opposite Bakers Close	21.6	15.0	15.2	0.1	10.5
DT49	Southwater 1	24.6	16.6	15.5	0.2	10.6
NAQO		-	40	40	35	20



**Table 5.5: Predicted air quality concentrations at sensitive receptors in 2028
“Do Something”**

Receptor Number and Name		NO _x	NO ₂	PM ₁₀		PM _{2.5}
		Annual mean µgm ⁻³	Annual mean µgm ⁻³	Annual mean µgm ⁻³	Days >50 µgm ⁻³	Annual mean µgm ⁻³
HO2	HO2	26.9	17.8	15.8	0.2	10.8
R1	House of the corner of Church Lane and Worthing Road	21.1	14.8	15.2	0.1	10.5
R2	Flats above Co-op	23.6	16.1	15.4	0.2	10.6
R3	Property on the corner of Station Road and Worthing Road	21.6	15.0	15.2	0.1	10.5
R4	Corner of Woodfield and Church Lane	18.8	13.5	15.0	0.1	10.4
R5	Southwater Junior Academy	19.4	13.8	15.0	0.1	10.4
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	23.2	15.8	15.3	0.2	10.6
R7	Residential Property opposite Bakers Close	21.7	15.1	15.2	0.1	10.5
DT4 9	Southwater 1	24.9	16.7	15.5	0.2	10.7
NAQO		-	40	40	35	20

5.19 Presented in Table 5.6 are the predicted change in concentrations of NO₂ and PM₁₀ and the change in the number of days where concentrations of PM₁₀ are greater than 50 µgm⁻³.



Table 5.6: Predicted change in air quality concentrations at sensitive receptors in 2028 “Do Something”

Receptor Number and Name		NO ₂	PM ₁₀		PM _{2.5}
		Change in annual mean μgm^{-3}	Change in annual mean μgm^{-3}	Change in days $>50 \mu\text{gm}^{-3}$ (%)	Change in annual mean μgm^{-3}
HO2	HO2	0.02	0.01	0.00	0.01
R1	House of the corner of Church Lane and Worthing Road	0.18	0.09	0.02	0.02
R2	Flats above Co-op	0.23	0.12	0.02	0.01
R3	Property on the corner of Station Road and Worthing Road	0.16	0.09	0.02	0.01
R4	Corner of Woodfield and Church Lane	0.13	0.07	0.02	0.01
R5	Southwater Junior Academy	0.09	0.05	0.01	0.00
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	0.22	0.11	0.02	0.01
R7	Residential Property opposite Bakers Close	0.12	0.06	0.01	0.01
DT49	Southwater 1	0.28	0.15	0.03	0.02

5.20 From Table 5.6 changes in concentration of NO₂ are predicted to be 0.28 μgm^{-3} or less and changes in concentration of PM₁₀ are predicted to be 0.15 μgm^{-3} or less. It can also be seen that the change in the number of days where the concentration of PM₁₀ is predicted to be more than 50 μgm^{-3} will be 0.03 days.

Magnitude of Change – 2028 with development

- 5.21 Comparing the results in Table 5.6 with the magnitude of change in Table 3.7 it can be seen that all the receptors are predicted to experience a change in annual mean NO₂ concentrations which is “Imperceptible” ($<0.4 \mu\text{gm}^{-3}$).
- 5.22 It can also be seen that all the receptors are predicted to experience an increase in annual mean PM₁₀ concentrations which is “Imperceptible” ($<0.4 \mu\text{gm}^{-3}$) and No Change in the number of days where PM₁₀ levels are greater than 50 μgm^{-3} .



“Significance” of Change – 2028 with development

5.23 The “Significance” of the predicted changes in NO₂ and PM₁₀ annual mean concentrations are presented in **Table 5.7**.

Table 5.7: NO₂ – Significance of change in annual mean concentrations following the completion of the proposed development in 2028

Receptor Number and Name		NO ₂		
		Change in annual mean (µgm ⁻³)	Magnitude of change	“Significance” of change
HO2	HO2	0.02	Imperceptible	Negligible
R1	House of the corner of Church Lane and Worthing Road	0.18	Imperceptible	Negligible
R2	Flats above Co-op	0.23	Imperceptible	Negligible
R3	Property on the corner of Station Road and Worthing Road	0.16	Imperceptible	Negligible
R4	Corner of Woodfield and Church Lane	0.13	Imperceptible	Negligible
R5	Southwater Junior Academy	0.09	Imperceptible	Negligible
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	0.22	Imperceptible	Negligible
R7	Residential Property opposite Bakers Close	0.12	Imperceptible	Negligible
DT49	Southwater 1	0.28	Imperceptible	Negligible

5.24 With reference to the overall concentration of NO₂ presented in Table 5.5 being below to the NAQO level of 40 µgm⁻³ and the magnitude of change being “Imperceptible”, the “Significance” of change in NO₂ concentrations is considered “Negligible”.



Table 5.8: PM₁₀ – Significance of change in annual mean concentrations following the completion of the proposed development in 2028

Receptor Number and Name		PM ₁₀		
		Change in annual mean (µgm ⁻³)	Magnitude of change	“Significance” of change
HO2	HO2	0.01	Imperceptible	Negligible
R1	House of the corner of Church Lane and Worthing Road	0.09	Imperceptible	Negligible
R2	Flats above Co-op	0.12	Imperceptible	Negligible
R3	Property on the corner of Station Road and Worthing Road	0.09	Imperceptible	Negligible
R4	Corner of Woodfield and Church Lane	0.07	Imperceptible	Negligible
R5	Southwater Junior Academy	0.05	Imperceptible	Negligible
R6	Residential Property on Worthing Road, opposite Southwater Junior Academy	0.11	Imperceptible	Negligible
R7	Residential Property opposite Bakers Close	0.06	Imperceptible	Negligible
DT49	Southwater 1	0.15	Imperceptible	Negligible

5.25 With reference to the overall concentrations of PM₁₀ presented in Table 5.5 being well below the objective level of 40 µgm⁻³ and the magnitude of change presented in Table 5.8 being “Imperceptible”, the “Significance” of change in PM₁₀ concentration is considered to be “Negligible”.

DEFRA Emissions Factor Toolkit

5.26 This section of the report uses the DEFRA Emissions Factor Toolkit (EFT) to estimate the additional pollutant emissions from Phase 5 of the proposed development site (version 12.0).

5.27 The EFT calculation uses the following development traffic input data (See: Horsham District Council Air Quality Action Plan – Planning Advice Document: Air Quality & Emissions Mitigation Guidance for Sussex (2021)).

- the relevant road type: Urban (not London)
- traffic flows: 477
- % HDV: 0%
- Speed: 48kph



- number of hours: 24
- Link length data: 10km (National Travel Survey UK average)
- Gradient: 0%
- Flow direction: Two way traffic
- Percentage Load: 0%

5.28 The first step is to quantify the change in emissions for NO_x and PM_{2.5} for 5 years of scheme operation.

Table 5.9: EFT Output (tonne/annum)

	2024	2025	2026	2027	2028
NO _x	0.4725	0.4226	0.375	0.3294	0.2867
PM _{2.5}	0.044	0.0433	0.0429	0.0422	0.0419

5.29 The second step is to calculate damage costs for NO_x and PM_{2.5} for 5 years of scheme operation. The costs per tonne are as follows: £8,148* tonne (NO_x) + £74,769* tonne (PM_{2.5}).

Table 5.10: Output from Damage Cost Appraisal Toolkit (£)**

	2024	2025	2026	2027	2028	Total
NO _x	3849.93	3443.34	3055.50	2683.95	2336.03	15368.76
PM _{2.5}	3289.84	3237.50	3207.59	3155.25	3132.82	16023.00
Totals	7139.77	6680.84	6263.09	5839.20	5468.85	31391.75

Constraints

5.30 The concentrations of NO₂ and PM_{2.5} have not been modelled within the development site as there will not be any significant levels of pollutants, based on the background pollutants concentrations and the proximity of main roads.

5.31 With reference to **Table 5.9** which provides the EFT output data based on the proposed development (Phase 5) with 94 residential dwellings, and the output from the damage cost appraisal toolkit, Table 5.10, the proposed air quality mitigation or compensation required will be at least equal to the value of £31,391.75.

* DEFRA IGCB Air Quality Damage Costs

** DEFRA Emissions Factor Toolkit



6.0 MITIGATION

Construction Phase

- 6.1 Monitoring during the construction phase should be considered in the management of operations to ensure that the nuisance thresholds are not exceeded at nearby sensitive locations. However, it is important to note that such limits are subjective (as “nuisance” caused by dust does not currently have a statutory limit applied to it).
- 6.2 Monitoring of dust could be achieved using a variety of sampling techniques, for example deposit (“Frisbee”) gauges, glass slides or high-volume air samplers located around the site perimeter and at the sensitive locations up to 250 metres from the site boundary.
- 6.3 In addition, there are several Best Practice mitigation measures that can be used by contractors to ensure that the impacts experienced near the construction site are minimal. Sample mitigation:
- 6.4 Specific to demolition (for information only):
- Ensure effective water suppression is used during demolition operations;
 - Avoid explosive blasting, using appropriate manual or mechanical alternatives;
 - Bag and remove any biological debris or damp down such material before demolition; and
- 6.5 Effective site planning:
- Erect solid barriers to site boundary;
 - Dust generating activities to be located away from sensitive receptors;
 - All site personnel will be fully trained;
 - There will be a trained and responsible manager on site during working times to maintain a logbook and carry out site inspections;
 - There will be no run off of mud or water from the site;
 - Relevant legislation and guidance will be adhered to; and
- 6.6 Construction Traffic
- All vehicles to switch off engines (no idling);
 - On road vehicles will comply to set emission standards;



- Effective vehicle cleaning and specific wheel-washing on leaving site;
- All loads entering site must be covered;
- All non-road mobile machinery (NRMM) should use ultra-low sulphur diesel where available; and

6.7 Site Activities

- Minimise dust generating activities where possible;
- Use water as a dust suppressant where applicable;
- Stockpiles will be covered, enclosed, seeded or kept them sheeted; and
- If applicable, any concrete crushers/batchers will have the required permits.

6.8 It is recommended that liaison with Horsham District Council Environmental Health Department be maintained throughout the construction process. In addition, the main contractor should nominate a representative (possibly the site manager) to act as a point of contact with the Council, the construction team, and the local community to ensure that any air quality related issues that occur during the construction period can be dealt with efficiently, effectively and promptly.

6.9 All other site sub-contractors should also nominate or appoint a suitable team member responsible for liaison with the lead contractor's representative and to ensure that sub-contractor construction activities are managed effectively.

6.10 Details of the proposed methodology for achieving this and procedures to follow have been set out in a Construction Environmental Management Plan (CEMP). This would be held on-site and would include relevant contact names, details, and lines of communication and mitigation action plans. The document should be available to all site personnel who should be made aware of its existence and provide an undertaking that they will adhere to the guidance provided therein.

6.11 The mitigation of PM₁₀ releases due to material disturbance will be achieved in the same manner as the control of dust releases. By achieving effective control of sources of dust release, PM₁₀ releases can be minimized.

6.12 The most effective control of particulate releases from site plant will be achieved by ensuring that it is maintained in good working order and is of the appropriate capacity and specification for the job being carried out. It should also be located away from the site perimeter, thereby maximizing the distance between source and receptor.



- 6.13 There may be occasions where breakdown of site plant could cause short-term releases of excess particulate matter (smoke) and odour. Short-term releases may also occur during start up (of diesel engines, etc.). Regular visual checks and routine maintenance should be applied in accordance with the plant specification, to ensure that these releases are minimised. Faulty site plant should be decommissioned until repairs have been carried out and have been tested and found to be operating satisfactorily.
- 6.14 The most effective mitigation will be achieved by ensuring that construction traffic vehicles are kept clean and sheeted when on public highways (using wheel washers) and avoid using sensitive roads. Timing of large-scale vehicle movements to avoid peak hours on the local road network would also be beneficial. Clear signposting to the site access for construction traffic should also be provided and direct traffic along routes agreed with the Council.
- 6.15 Early morning delivery vehicles, which may arrive prior to the site opening, should be prevented from waiting on the approach roads to the site. If site deliveries arrive prior to the site opening, they should wait at a suitable location, and if possible, turn the engine off.
- 6.16 With the implementation of the appropriate mitigation measures detailed above, but not restricted to the information detailed above, the residual effects will normally be “Not Significant”.

Mitigation: Operational Phase

- 6.17 Taking into the account predicted “Negligible” increases in NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive receptors due to the development generated traffic following the completion of Phase 5 of the development, and the fact that concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be below the NAQO level of 40 µgm⁻³, no additional mitigation is proposed.
- 6.18 Within the development site concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be well below the NAQO level of 40 µgm⁻³. Therefore, there are no proposals to mitigate air quality within the site other than what is detailed below.
- 6.19 However, in line with best practice guidance it is proposed to integrate some of the surplus subsoil and topsoil into the landscape design and thereby minimise the number of HGV movements associated with excavated material.

DEFRA EFT

- 6.20 The proposed air quality mitigation or compensation required will therefore be at least equal to the value of £31,391.75. Effective on-site mitigation measures are



the preferred option. However, if mitigation measures are not available or are not suitable, the Local Planning Authority can seek compensation for any amount less than the amount stated above (using a Section 106 Agreement).

- 6.21 Table 3 of the Council's Air Quality Action Plan (see paragraph 4.2 earlier) defines large development as being greater than 10 dwellings. Since the proposed development of 94 dwellings can be regarded as large in scale, the Council's guidance for residential development mitigation measures are provided, and incorporated into scheme design as standard.

Mitigation: Electric Vehicle Charging Points

- 6.22 A fundamental theme of the NPPF is that future occupiers of new developments are able to make green vehicle choices, and that new developments provide, where it is practicable, facilities for charging plug-in/ultra-low emission electric vehicles.
- 6.23 Policy 41 (Parking) of the adopted Local Plan requires that, adequate parking and facilities must be provided within developments to meet the needs of anticipated users, with consideration given to the needs of cycle parking, motorcycle parking, charging plug-in or other low emission vehicles and the mobility impaired.
- 6.24 Draft Policy 25 (Parking) of the emerging draft Regulation 19 Local Plan seeks to secure plug-in charging facilities for all new residential parking spaces or at a minimum the infrastructure to enable easy installation in the future, with at least 20% of communal spaces equipped with active charging facilities and the infrastructure to enable easy activation of all spaces as demand increases.
- 6.25 Whilst Policy SNP15 (Driving in the 21st Century) of the Southwater Neighbourhood Plan (2021) seeks to ensure that car charging points can or will be installed adjacent to all parking spaces on site with ease (either now or in the future).
- 6.26 In this case it is proposed that each home will have either a dedicated on plot car charging point or access to an external car charging within the parking courtyards. While visitor parking will be equipped with the infrastructure to enable future installation if the demand requires such.



7.0 SUMMARY AND CONCLUSIONS

- 7.1 Stuart Michael Associates has been engaged Berkeley Homes (Southern Limited) to undertake an air quality assessment at the proposed development site at Land West of Southwater – Phase 5.
- 7.2 The assessment has been undertaken to demonstrate the impact on concentrations of NO₂ and PM₁₀ at sensitive receptors because of development generated traffic. Annual average concentrations have been compared to the National Air Quality Objective Levels and the magnitude and significance of change has also been assessed against national guidelines.
- 7.3 Constraints on development have been assessed using background concentrations, existing and future emissions from road at the proposed development site.
- 7.4 Also assessed are the likely impacts from the construction of the development. The impact assessment has been undertaken using the method detailed in the Institute of Air Quality Management (IAQM) publication “Guidance on the assessment of dust from demolition and construction” (2023).
- 7.5 Concentrations of NO₂ and PM₁₀ at one diffusion tube (DT) (site 49) and the Horsham Park Way (HO2) continuous monitoring site (CMS) have been assessed using ADMS Roads. The 2019 NO₂ concentrations from HO2 and DT48 have been used to verify the results from the modelling.
- 7.6 Base concentrations have been calculated for 2024 and two scenarios have been assessed for the future year 2028. The first is a “Do Nothing” scenario with committed development generated traffic but no Phase 5 development generated traffic and the second scenario is “Do Something” with committed development generated traffic and Phase 5 development generated traffic. The two scenarios have been assessed to gauge the magnitude of change in concentrations NO₂, PM₁₀ and PM_{2.5} and the significance of those changes.
- 7.7 Development generated road traffic data has been obtained from WSP. Future traffic flows have been growthed to obtain the future year 2028.
- 7.8 Following the completion of Phase 5 of the development, there is predicted to be an increase of between 0.2% and 8.4% in 24 hour traffic flows along the links within the assessment area.
- 7.9 The concentrations of NO₂ in 2028 are predicted to be below the objective level of 40 µgm⁻³. The magnitude of change in annual mean concentrations at all the



- receptors due to development generated traffic is predicted to be “Imperceptible. Therefore the “Significance” of change is “Negligible.
- 7.10 Concentrations of PM₁₀ and PM_{2.5} are predicted to be below the objective level of 40 µgm⁻³ and 25 µgm⁻³ respectively at the receptor locations and the magnitude of change due to development generated traffic is “Imperceptible”. Therefore, the significance is considered “Negligible.
- 7.11 From the construction dust assessment: during the Earthworks phase of development, there is a Medium Risk of annoyance caused by dust soiling and a Low Risk of health effects due to increase exposure in PM₁₀.
- 7.12 During the Construction phase of development, it has been assessed that there is a Medium Risk of potential annoyance to people and property caused by dust soiling and a Medium Risk of health effects due to an increase exposure in PM₁₀. Mitigation in the form of active management is therefore proposed within the CEMP.
- 7.13 Throughout the Trackout processes, there is a Low Risk of dust soiling and human health effects due to an increase exposure in PM₁₀.
- 7.14 For those cases where the risk category is Negligible (i.e. ecological), no specific mitigation measures is required beyond specific legislation. Although, in line with best practice guidance it is proposed to integrate some of the surplus subsoil and topsoil into the landscape design and thereby minimise the number of HGV movements associated with excavated material.
- 7.15 Within the development site concentrations of NO₂ are predicted to be well below the NAQO levels 40 µgm⁻³. This is further helped by the applications commitment to install EV charging for each home.
- 7.16 Based on the results of the AQA, it has been concluded that with appropriate mitigation, air quality concentrations are acceptable for future residents of the proposed Land West of Southwater Phase 5 development. Moreover, the impact of development on local sensitive receptors is predicted to be negligible during both construction and operational phases. Therefore, in terms of the planning application, the proposed Land West of Southwater Phase 5 development is acceptable from an air quality perspective.



8.0 FIGURE

Figure 1.1 Site Location Plan



9.0 APPENDICES

Appendix 1 Site Layout – Drawing Number S835/SL/001 Revision D Dated
26/06/24





Appendix 2 Horsham DC AQMAS

Figure D.2 – Map of Horsham Monitoring Sites

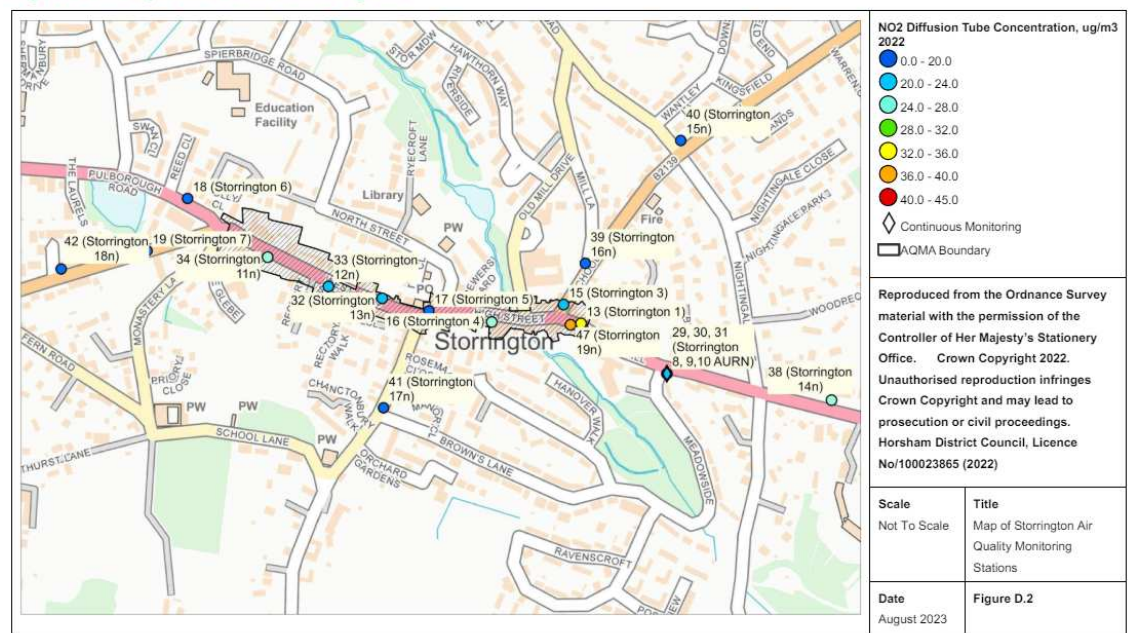
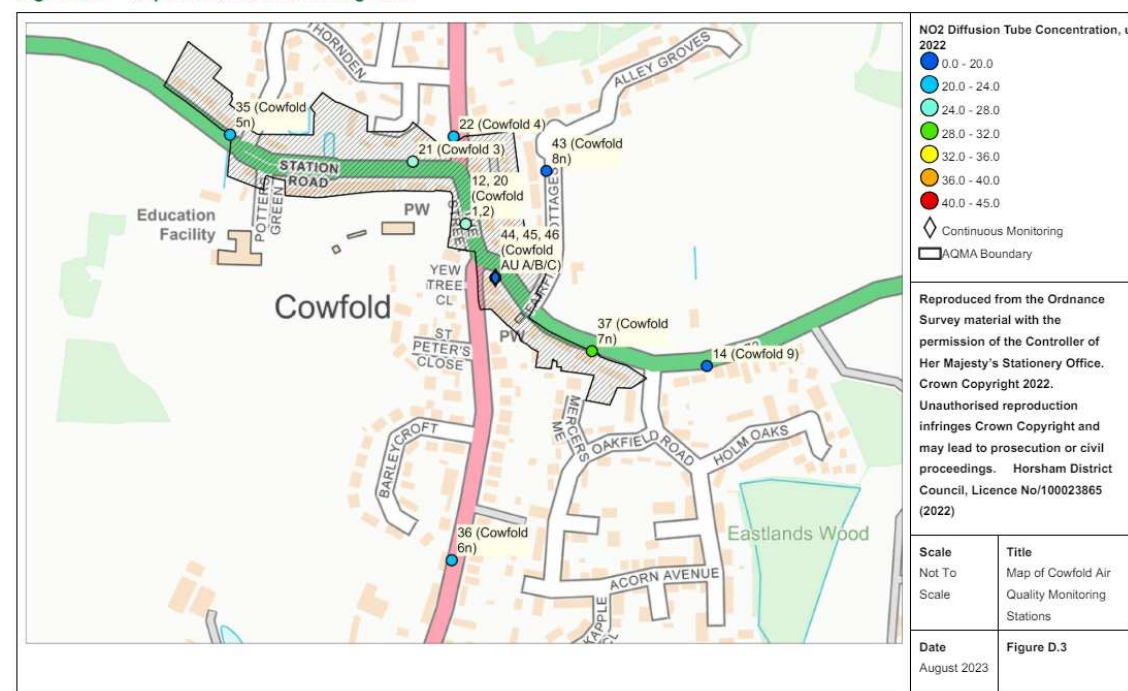


Figure D.3 – Map of Cowfold Monitoring Sites





Appendix 3 National Air Quality Objectives (NAQO)

National air quality objectives and European Directive limit and target values for the protection of human health						
Pollutant	Applies	Objective	Concentration measured as ¹⁰	Date to be achieved by (and maintained thereafter)	European Obligations	Date to be achieved (by and maintained thereafter)
Particles (PM ₁₀)	UK	50 µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	31 December 2004	50 µg/m ³ not to be exceeded more than 35 times a year	1 January 2005
	UK	40 µg/m ³	annual mean	31 December 2004	40 µg/m ³	1 January 2005
	Indicative 2010 objectives for PM ₁₀ (from the 2000 strategy and Addendum) have been replaced by an exposure reduction approach for PM _{2.5} (except in Scotland – see below)					
	Scotland	50 µg/m ³ not to be exceeded more than 7 times a year	24 hour mean	31 December 2010	50 µg/m ³ not to be exceeded more than 35 times a year	1 January 2005
	Scotland	18 µg/m ³	annual mean	31 December 2010	40 µg/m ³	1 January 2005
Particles (PM _{2.5}) Exposure Reduction	UK (except Scotland)	25 µg/m ³	annual mean	2020	Target value - 25 µg/m ³	2010
	Scotland	10 µg/m ³		31 December 2020	Limit value - 25 µg/m ³	1 January 2015
	UK urban areas	Target of 15% reduction in concentrations at urban background		Between 2010 and 2020	Target of 20% reduction in concentrations at urban background.	Between 2010 and 2020

National air quality objectives and European Directive limit and target values for the protection of human health						
Pollutant	Applies	Objective	Concentration measured as ¹	Date to be achieved by (and maintained thereafter)	European Obligations	Date to be achieved by (and maintained thereafter)
Nitrogen dioxide	UK	200 µg/m ³ not to be exceeded more than 18 times a year	1 hour mean	31 December 2005	200 µg/m ³ not to be exceeded more than 18 times a year	1 January 2010
	UK	40 µg/m ³	annual mean	31 December 2005	40 µg/m ³	1 January 2010
Ozone	UK	100 µg/m ³ not to be exceeded more than 10 times a year	8 hour mean	31 December 2005	Target of 120 µg/m ³ not to be exceeded by more than 25 times a year averaged over 3 years	31 December 2010
Sulphur dioxide	UK	266 µg/m ³ not to be exceeded more than 35 times a year	15 minute mean	31 December 2005	-	-
	UK	350 µg/m ³ not to be exceeded more than 24 times a year	1 hour mean	31 December 2004	350 µg/m ³ not to be exceeded more than 24 times a year	1 January 2005
	UK	125 µg/m ³ not to be exceeded more than 3 times a year	24 hour mean	31 December 2004	125 µg/m ³ not to be exceeded more than 3 times a year	1 January 2005
Polycyclic Aromatic Hydrocarbons	UK	0.25 ng/m ³ B[a]P	as annual average	31 December 2012	1.0 ng/m ³	31 December 2012



National air quality objectives and European Directive limit and target values for the protection of human health						
Pollutant	Applies	Objective	Concentration measured as ¹	Date to be achieved by (and maintained thereafter)	European Obligations	Date to be achieved by (and maintained thereafter)
Benzene	UK	16.25 µg/m ³	running annual mean	31 December 2003	-	-
	England and Wales	5 µg/m ³	annual average	31 December 2010	5 µg/m ³	1 January 2010
	Scotland, Northern Ireland	3.25 µg/m ³	running annual mean	31 December 2010	-	-
1,3-butadiene	UK	2.25 µg/m ³	running annual mean	31 December 2003	-	-
Carbon monoxide	UK	10 mg/m ³	maximum daily running 8 hour mean/in Scotland as running 8 hour mean	31 December 2003	10 mg/m ³	1 January 2005
Lead	UK	0.5 µg/m ³	annual mean	31 December 2004	0.5 µg/m ³	1 January 2005
		0.25 µg/m ³	annual mean	31 December 2008	-	-

National air quality objectives and European Directive limit and target values for the protection of vegetation and ecosystems						
Pollutant	Applies	Objective	Concentration measured as ¹	Date to be achieved by (and maintained thereafter)	European Obligations	Date to be achieved by (and maintained thereafter)
Nitrogen oxides	UK	30 µg/m ³	annual mean	31 December 2000	30 µg/m ³	19 July 2001
Sulphur dioxide	UK	20 µg/m ³	annual mean	31 December 2000	20 µg/m ³	19 July 2001
	UK	20 µg/m ³	winter average	31 December 2000	20 µg/m ³	19 July 2001
Ozone: protection of vegetation and ecosystems	UK	Target value of 18,000 µg/m ³ based on AOT40 to be calculated from 1 hour values from May to July, and to be achieved, so far as possible, by 2010	Average over 5 years	1 January 2010	Target value of 18,000 µg/m ³ based on AOT40 to be calculated from 1 hour values from May to July, and to be achieved, so far as possible, by 2010	1 January 2010



Appendix 4 Gatwick Airport Wind Rose – 2019

