West Sussex County Council

A29 REALIGNMENT PHASE 1

Environmental Statement - Chapter 6

VERSION 2
MAY 2021

CONFIDENTIAL

West Sussex County Council

A29 REALIGNMENT PHASE 1

Environmental Statement - Chapter 6

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70079718

OUR REF. NO. VERSION 2

DATE: MAY 2021

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6 AIR QUALITY

6.1 INTRODUCTION

6.1.1 This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon local air quality.

6.1.2 The remainder of the chapter describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions, as well as a summary of the likely significant effects leading to the secondary mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects, and the likely residual effects and any required monitoring after these measures have been employed.

6.1.3 This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, introductory chapters (**Chapters 1 - 5**) and **Chapter 14 Cumulative Effects.**

6.2 LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

LEGISLATIVE FRAMEWORK

6.2.1 The applicable legislative framework is summarised in **Table 6-1**.

Table 6-1 - Air Quality: Summary of Legislation

Legislation	Summary
The Environmental Protection Act 1990 (Ref. 6.1)	Section 79 of the Environmental Protection Act gives the following definitions of statutory nuisance relevant to dust and particles, and is particularly relevant to construction activities: *"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance;* *Any accumulation or deposit which is prejudicial to health or a nuisance"* Under Section 80, where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.
The Environment Act 1995 (Ref. 6.2)	Part IV of the Environment Act requires the Secretary of State to publish a national Air Quality Strategy and set up a system of Local Air Quality Management (LAQM). Local authorities are required to periodically review and document local air quality, with the aim of meeting the air quality objectives defined in the Air Quality Regulations. Where a local authority determines that one or more or the objectives are unlikely to be achieved it is required to designate an AQMA. For each AQMA the local authority must produce an Air Quality Action Plan to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

Air Quality (England) Regulations 2000 (Ref. 6.3) and Air Quality (England) (Amendment) Regulations (2002) (Ref. 6.4)	The Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 set the standards and objectives for ambient pollutant concentrations. The objectives apply where there is relevant exposure: *"at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…".*
Air Quality Standards Regulations (2010) (Ref. 6.5) and Air Quality Standards (Amendment) Regulations (2016) (Ref. 6.6)	The Air Quality Standards Regulations 2010, transpose the European Union (EU) Ambient Air Quality Directive 2008/50/EC into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health, such as nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$). The limit values are numerically the same as the objectives.

6.2.2 The air quality standards (AQS), in terms of objectives and limit values that are relevant to this assessment, are given in **Table 6-2**.

Table 6-2 - Relevant Air Quality Standards

Pollutant	Concentration in micrograms per cubic metre (µg/m3)	Measured as	Maximum number of exceedances allowed
NO2	40	Annual mean	-
	200	1-hour means	18 times a year
PM10	40	Annual mean	-
	50	24-hour mean	35 times a year
PM2.5	25	Annual mean	-

POLICY

6.2.3 The applicable policy framework is summarised in **Table 6-3**.

Table 6-3 - Air Quality: Summary of Policy

Policy	Summary
UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (UK Plan (Ref. 6.7)	The UK Plan sets out measures for bringing NO_2 levels within the limit values in the shortest possible time. This document sets out the roles and responsibilities for national government, local authorities (LAQM) and other for delivering the UK Plan objective. None of the local authorities in the West Sussex County Council (WSCC) area, which is within the South East Zone for reporting limit value compliance, are identified in the UK Plan as non-compliant.
Clean Air Strategy (2019) (Ref. 6.8)	The Clean Air Strategy sets out the comprehensive action required from all parts of government and society to help meet EU limit values for the five most damaging air pollutants: NO_2, $PM_{2.5}$, ammonia, sulphur dioxide, non-methane volatile organic compounds. The immediate challenge is to reduce NO_x emissions due to non-compliance with the limit value for annual mean NO_2. Targets for action include road traffic to reduce ambient NO_2 concentrations, and domestic coal and wood burning to improve ambient $PM_{2.5}$ concentrations.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Ref. 6.9)	Government policy on air quality within the UK, which predates the Clean Air Strategy 2019, is set out in The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. This provides a framework for reducing air pollution in the UK with the aim of meeting the objectives and mandatory limit values set by the Air Quality Regulations.
National Planning Policy Framework (Ref. 6.10)	The NPPF has an overarching environmental objective to protect and enhance our environment and to minimise pollution. Paragraph 181*: "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*
West Sussex Transport Plan 2011 – 2026 (Ref 6.11)	The West Sussex Transport Plan sets out a long-term strategy that includes improvement of air quality and commitment to working with districts and borough councils where AQMAs have been declared in the development of Air Quality Action Plans. For Arun district there is commitment *to "improving network efficiency in order to improve journey times and air quality".* The A29 is one of the routes that is identified with congestion issues to be resolved as part of the implementation plan.
Breathing Better - A partnership approach to improving air quality in West Sussex (Ref. 6.12)	The West Sussex Inter-Authority Air Quality Group (including WSCC, Arun and other West Sussex local authorities) plan states that *"All of the local authorities in West Sussex are committed to working together to improve the quality of the air that we breathe."* *"This Plan provides information about air quality across the County, and outlines some of the work taking place to reduce levels of pollution. It is a working document and will be updated when necessary and will be reviewed annually."*
Arun Local Plan 2011 - 2031 (Ref. 6.13)	Policy QE DM3: Air Quality requires major development proposals to assess the likely air quality impacts and ensure appropriate mitigation to address negative impacts in line with LAQM objectives. Policy QE SP1: Quality of the Environment *"requires that all development contributes positively to the quality of the environment and will ensure that development does not have a significantly negative impact upon residential amenity, the natural environment or upon leisure and recreational activities enjoyed by residents and visitors to the District."* The Scheme will provide improvement to road transport infrastructure that helps to reduce traffic congestion thereby supporting the Local Plan objectives.

GUIDANCE

6.2.4 The applicable guidance documents are summarised in **Table 6-4** below.

Table 6-4 - Air Quality: Summary of Guidance

Policy	Summary
National Planning Practice Guidance (Ref. 6.14)	The Planning Practice Guidance provides an introduction how to identify areas of concern as part of the planning process, details to be considered as part of an air quality assessment, when air quality can be relevant to the planning process and how to mitigate potential effects on local air quality. The Planning Practice Guidance summarises the way that air quality fits into the overall planning management process in the context of UK and EU legislation.
Local Air Quality Management Review and Assessment Technical Guidance (Ref. 6.15)	Defra has published technical guidance for use by local authorities in their review and assessment work. The guidance has been used in this assessment: to annualise baseline monitoring data; in reporting impacts on 1-hour mean NO_2 and 24-hour mean PM10 concentrations; and in dispersion model verification.
Design Manual for Roads and Bridges (DMRB), LA 105 Air Quality (Ref. 6.16)	Highways England's guidance document sets out the requirements for assessing and reporting the effects of road scheme projects on air quality for human receptors and designated habitat sites. The guidance is mandatory for Strategic Road Network schemes but is also used to inform the assessment of non-Strategic Road Network schemes. The guidance has been used in this assessment to define the extent of the study area and in the assessment of Construction Stage impacts.
Land-Use Planning and Development Control: Planning for Air Quality (Ref. 6.17)	Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published guidance when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts. The guidance has been used in this assessment to describe the impacts and in determining the overall significance of effect of impacts in the construction and Operational Stages of the Scheme.

6.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

6.3.1 **Table 6-5** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 6-5 - Air Quality: Summary of Consultation Undertaken

Body / organisation	Individual / statutory body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Arun District Council (ADC).	Joanne Lewis, Senior Environmental Health Officer	Email correspondence on 21th May 2020.	Agreement on the scope and methodology of air quality assessment presented in this chapter.
ADC	Joanne Lewis, Senior Environmental Health Officer	Telephone meeting on 5th March 2021.	Clarification on location of ADC diffusion tube 'Bog 13', which is on Rowan Way and not within 2km of the Scheme. Include consideration of air quality impacts in relation to emerging development proposals to the south of Barnham Road, adjacent to Phase 2.

SCOPE OF THE ASSESSMENT

6.3.2 The scope of this chapter has been established through an ongoing scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

Elements Scoped out of the Assessment

6.3.3 The elements shown in **Table 6-6** are not considered to give rise to likely significant effects as a result of the Scheme and have therefore not been considered within the ES.

Table 6-6 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Air quality impacts due to emissions from construction plant and traffic	The Construction Stage is expected to last less than 2 years. On this basis, according to DMRB guidance *"it is unlikely that the construction activities would constitute a significant air quality effect"* (Ref. 6.16)
Air quality impacts at designated habitat sites (construction and Operational Stages)	There are no designated habitat sites within 200m of the Scheme or affected road network (ARN) as determined by application of DMRB scoping criteria (Ref. 6.16).

Elements Scoped into the Assessment

6.3.4 The elements shown in **Table 6-7** are considered to have the potential to give rise to likely significant effects during construction of the Scheme and have therefore been considered within the ES.

Table 6-7 - Elements Scoped into the Assessment

Element scoped in	Justification
Construction dust impacts	Originally scoped out from further assessment in the Scoping Report (**Appendix 5.1**) but was

	subsequently scoped back into the assessment following WSCC Scoping Opinion (**Appendix 5.2**).
Local air quality impacts due to road traffic emissions at human receptors once the Scheme is open	Locations with relevant exposure to air pollutants within 200m of the ARN.

EXTENT OF THE STUDY AREA

Construction Stage

6.3.5 The DMRB (Ref. 6.16) considers construction dust impacts within 200m of construction activities. Beyond this distance all impacts would be imperceptible. The study area for Construction Stage impacts was therefore limited to within 200m of the Scheme boundary (shown in **Figure 6-1**).

Operational Stage

6.3.6 DMRB (Ref. 6.16) scoping criteria were applied to changes in traffic and road alignment with the Scheme to determine the extent of the study area for Operational Stage impacts. The criteria are used to determine the ARN, which comprises all road links with changes that could have a perceptible impact on local air quality and all adjoining roads within 200m. Roads included in the ARN met one or more of the following criteria:

- change in annual average daily traffic (AADT) flow of 1,000 or more; or
- change in heavy duty vehicle (HDV) AADT flow of 200 or more; or
- change in carriageway alignment of 5m or more.

6.3.7 The study area extends to 200m from the ARN (shown in **Figure 6-1**) as beyond this distance all impacts would be imperceptible. It should be noted that the study area shown is based on the ARN for the Scheme + Phase 2 to enable the cumulative impacts to be considered (refer to **Chapter 14: Cumulative Effects**). The ARN for the Scheme alone is smaller.

METHOD OF BASELINE DATA COLLATION

Desk Study

6.3.8 A desktop study was undertaken to determine existing and future baseline conditions in the study area. The following sources of information were reviewed:

- ADC's 2020 Air Quality Annual Status Report (Ref. 6.18);
- Defra's Pollution Climate Mapping (PCM) model data (Ref. 6.19);
- Ordnance Survey data; and
- Modelled concentrations.

Site Visit and Surveys

6.3.9 WSP carried out a NO2 diffusion tube survey to determine baseline conditions at roadside locations along the existing A29 between Shripney and Fontwell Park Race Course and adjoining roads (shown in **Figure 6-2**). The survey was scheduled for a period of six months between 30 September 2019 to 20 April 2020. Due to the COVID-19 outbreak it was necessary to curtail the survey after five months; nevertheless, sufficient data were collected to determine annual mean concentrations (a minimum of three months is required). The survey findings are considered later in this chapter under 'Baseline Conditions'.

ASSESSMENT METHODOLOGY

Construction Stage

6.3.10 The assessment of construction dust impacts has been undertaken following DMRB guidance (Ref. 6.16). The assessment considers the construction dust risk potential based on the overall scale of the works (**Table 6-8**) and the sensitivity of the receiving environment based on the scale and proximity of receptors to the works (**Table 6-9**). The construction dust risk potential is used to inform the measures required to support the proposed mitigation.

Table 6-8 – Construction Dust Risk Potential

Risk	Examples of the types of project (as given in the DMRB)
Large	Large smart motorway projects, bypass and major junction improvements.
Small	Junction congestion relief project i.e. small junction improvements, signalling changes. Short smart motorway projects.

Table 6-9 – Receiving Environment Sensitivity to Construction Dust

Risk Potential	Distance from Construction Activities		
	0 – 50 m	50 – 100 m	100 – 200 m
Large	High	High	Low
Small	High	Low	Low

Operational Stage

Road Traffic Emissions

6.3.11 The pollutants of concern are NO_2, PM_{10} and $PM_{2.5}$ due to road traffic emissions. The following scenarios were considered:

- 2017 base year (existing baseline);
- 2023 do-minimum (future baseline);
- 2023 do-something (future baseline + the Scheme); and
- Cumulative (future baseline + the Scheme + Phase 2), reported in **Chapter 14: Cumulative Effects**.

6.3.12 For each scenario, the road traffic contributions to annual mean concentrations of NOX, PM10 and PM2.5 at sensitive receptors were estimated by detailed dispersion modelling using ADMS-Roads (version 5.0.0.1) software (Ref. 6.20). ADMS-Roads is an established industry standard assessment tool that is widely used by consultants and government organisations alike.

6.3.13 The ADMS-Roads models were based on traffic data prepared by WSP, vehicle emissions data published by Defra, Ordnance Survey map data products, and meteorological data from a representative weather station.

6.3.14 The traffic data were used to determine the pollutant emissions from each modelled road link. The data for each road link included AADT flow, average speed and the percentage HDV. The data used for the Cumulative scenario accounts for committed schemes in the Arun district (including the Local

Plan) and the Phase 2 of the A29 Alignment (see Chapter 14: Cumulative Effects). The traffic data used for the ARN are included in **Appendix 6.1**.

6.3.15 Vehicle emissions data for 2017 and 2023 were obtained from Defra's Emissions Factors Toolkit version 9.0 (Ref. 6.21). This enables the calculation of vehicle emissions data for all years between 2017 and 2030. In forecasting emissions, it accounts for anticipated advances in vehicle technologies and changes in vehicle fleet composition that would bring about reductions in vehicle emissions over time.

6.3.16 Road source contributions to annual mean NO_X, PM_{10} and $PM_{2.5}$ were modelled at 20 human receptor locations including those that are likely to experience the most noticeable impacts with the Scheme. These receptors are identified in Table 6-10 and shown in **Figure 6-2**.

Table 6-10 – Operational Stage Receptors

Receptor	Description	OS Grid Reference		Height above ground level (m)
		X	Y	
E01	A29 Shripney Road to south of Shripney Lane (residential property)	493835	102015	1.5
E02	A29 Shripney Road at north end of Shripney village (residential property)	493759	102503	1.5
E03	A29 Shripney Road opposite Lidsey Caravan Park (residential property)	493901	102877	1.5
E04	A29 Shripney Road opposite Lidsey Caravan Park (residential property)	493939	103052	1.5
E05	A29 Lidsey Road between Woodgate Road and Oak Tree Lane, Woodgate (residential property)	493813	104136	1.5
E06	A29 Westergate Street opposite Orchard Gardens, Westergate (residential property)	493781	104517	1.5
E07	A29 Westergate Street at corner of Oaks Close, Westergate (residential property)	493866	104981	1.5
E08	A29 Nyton Road, Westergate (residential properties)	493933	105561	1.5
E09	A29 Nyton Road at junction with B2233 Barnham Road, Eastergate (residential property)	494385	105605	1.5
E10	B2233 Barnham Road, Eastergate (residential property)	494824	105440	1.5
E11	Green Oaks, B2233 Barnham Road, Eastergate (residential property)	495234	105135	1.5
E12	Chantry Mead, Eastergate (residential property)	495312	105335	1.5
E13	Barnham Manor, B2233 Barnham Road, West Barnham (residential property)	495418	105021	1.5
E14	B2233 Barnham Road at corner of Elm Grove, West Barnham (residential property)	495589	104814	1.5

E15	Farnhurst Road, West Barnham (residential property)	495923	104610	1.5
E16	A29 Fontwell Avenue at corner of Collins Close, Eastergate (residential property)	494562	105721	1.5
E17	A29 Fontwell Avenue, Eastergate (residential property)	494630	105883	1.5
E18	Greenfields Farm, A29 Fontwell Avenue, Eastergate (residential property)	494596	105956	1.5
E19	A29 Fontwell Avenue opposite Eastergate Lane, Eastergate (residential property)	494672	106091	1.5
E20	Claremont Lodge Nursing Home, A29 Fontwell Avenue, Fontwell (residential premises)	494869	106522	1.5

6.3.17 To determine total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ at each receptor it was necessary to add the contributions from sources in the wider area which were not explicitly modelled to determine the total NO_2, PM_{10} and $PM_{2.5}$ concentrations. To account for these wider area contributions, 'background' pollutant concentration data, as published by Defra, have been used (Ref. 6.22) and are given in **Table 6-11**.

Table 6-11 – Background Concentrations (µg/m3)

Grid Reference		2017			2023		
X	Y	NO2	PM10	PM2.5	NO2	PM10	PM2.5
493500	102500	10.0	15.0	9.6	8.1	14.1	8.9
493500	103500	10.8	15.3	9.6	9.0	14.4	8.8
493500	104500	10.3	14.7	9.7	8.5	13.8	8.9
493500	105500	10.4	14.9	9.7	8.5	14.0	8.9
494500	105500	10.8	14.4	9.7	8.9	13.5	8.9
495500	105500	9.9	13.8	9.4	8.1	12.9	8.6
495500	104500	10.5	14.6	9.7	8.7	13.7	8.9
494500	105500	10.8	14.4	9.7	8.9	13.5	8.9
494500	106500	10.9	14.0	9.4	8.9	13.1	8.7

6.3.18 Meteorological data for each hour in 2017 were used in modelling. The data were taken from the meteorological station at Shoreham which is considered to be reasonably representative of conditions in the study area. A wind rose, generated from the meteorological data, showing the frequencies of the different wind speeds and directions is included in **Appendix 6.2**. The prevailing winds are south-westerly with a notable relative high frequency of northerly winds.

6.3.19 To estimate total annual mean NO_2 at each receptor, to compare with the annual mean air quality objective (40µg/m^3), it was necessary to convert the road source contributed NO_X to NO_2. This involves complex chemical reactions and was done using Defra's NO_X to NO_2calculator, version 7.1 (Ref. 6.23). To consider compliance with the 1-hour mean AQS for NO_2 (200µg/m^3 not to be exceeded more than 18 times a year), the approach recommended by Defra (Ref. 6.12) was adopted - where non-compliance is likely if the annual mean concentration exceeds 60µg/m^3.

6.3.20 To estimate total annual means for PM_{10} and $PM_{2.5}$, to compare with the annual mean AQS of 40µg/m^3 and 25µg/m^3 respectively, the model output concentrations were added to the background concentrations for these pollutants. To consider compliance with the 24-hour mean air quality objective for PM_{10} (50µg/m^3 not to be exceeded more than 35 times a year) Defra guidance (Ref. 6.12) gives the following equation:

Number of 24-hour mean excee$_{da}$nces = -18.5 + 0.00145 x annual mean + (206/annual mean)
Note: the number 24-hour mean exceedances is only valid where the annual mean concentration is greater than 15µg/m^3

6.3.21 To determine the performance of the model and enable adjustment to compensate for any systematic under or over- estimation, a comparison of modelled concentrations for 2017 with data from roadside WSP survey was undertaken. This process is known as model verification and was undertaken following standard procedure given in Defra's technical guidance document LAQM.TG(16) (Ref. 6.15). As is common in dispersion modelling of road traffic sources, the model was found to generally under-predict road contributed pollutant concentrations. To compensate for this under-prediction, all model output concentrations were adjusted by a factor derived by the verification process. Further details of model verification and adjustment are given in **Appendix 6.3**.

SIGNIFICANCE CRITERIA

6.3.22 The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Scheme, as well as a number of other factors that are outlined in more detail in **Chapter 5: Approach to EIA**. The sensitivity of each affected receptor was assessed on a scale of high, medium, low and negligible, and the magnitude of change was assessed on a scale of large, medium, small, negligible and no change, as set out in **Chapter 5: Approach to EIA**.

Construction Stage

6.3.23 Construction dust impacts would be short-term and temporary in nature. The DMRB (Ref. 6.16) advises that "*With best practice construction mitigation measures the impact of construction dust are unlikely to trigger a significant air quality effect".*

Operational Stage

6.3.24 The approach provided in the joint EPUK/IAQM guidance (Ref. 6.17) was used to describe the air quality impact due to the predicted change in annual mean concentration of a pollutant at each receptor. Details are given in **Table 6-12**.

Table 6-12 - Impact Descriptors for Individual Receptors

Annual mean concentration at receptor in assessment year	Percentage (%) change in concentration relative to the AQS			
	1	2-5	6-10	>10

75% or less AQS	Negligible	Negligible	Slight	Moderate
76-94% of AQS	Negligible	Slight	Moderate	Moderate
95-102% of AQS	Slight	Moderate	Moderate	Large
103-109% of AQS	Moderate	Moderate	Large	Large
110% or more of AQS	Moderate	Large	Large	Large

Notes:
The EPUK/IAQM guidance uses the term Air Quality Assessment Level (AQAL). This is equivalent to the term 'AQS' that has been used in this assessment. The descriptor term 'substantial' as used in the EPUK/IAQM has been altered to 'large' to align with the terminology for describing impacts used in the ES.
In applying this table, the percentage changes in pollutant concentrations are rounded to whole numbers. For example, a percentage change that is less than 0.5% is rounded to 0% and is regarded as 'negligible' regardless of whether the predicted concentration exceeds the AQS or not.
When defining the concentration as a percentage of the AQS, the 'without scheme' concentration is used where there is a decrease in pollutant concentration and the 'with scheme' concentration where there is an increase.
Where concentrations increase, the impact is described as adverse, and where it decreases it's described as beneficial.
The impact descriptors do not in themselves define the significance of effect but are intended to assist the assessor determining the overall significance of effect using professional judgement.

6.3.25 In determining if the overall effect is significant the following were considered:

- The magnitude of each change in ambient pollutant concentration at each existing receptor;
- The existing and future air quality in the absence of the Scheme;
- The extent of current population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

6.3.26 The EPUK/IAQM guidance (Ref. 6.17) advises that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10}concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations arising from the Operational Stage have therefore been determined qualitatively using professional judgement and the principles described above.

EFFECT SIGNIFICANCE

6.3.27 The following terms have been used to define the significance of the effects identified and apply to both beneficial and adverse effects:

- **Major effect**: where the Scheme could be expected to have a substantial improvement or deterioration on receptors – for example, where the improvement/deterioration would enable/impede South East Zone limit value compliance;
- **Moderate effect**: where the Scheme could be expected to have a noticeable improvement or deterioration on receptors – for example, where the improvement/deterioration would

reduce/worsen pollutant concentrations that currently exceed objectives within an existing AQMA or result in an existing AQMA being revoked or a new AQMA being declared;
- **Minor effect**: where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors – for example, where the improvement/deterioration would reduce/increase pollutant concentrations at receptors without exceeding the AQS; and
- **Negligible**: where no discernible improvement or deterioration is expected as a result of the Scheme on receptors, including instances where no change is confirmed.

6.3.28 Effects that are classified as **moderate or above** are considered to be **significant**. Effects classified as minor and below are considered to be **not significant**.

6.4 BASELINE CONDITIONS

6.4.1 The Scheme is set within a predominantly rural area just to the north of the village of Eastergate. The main source of local air pollution within the study area is road traffic.

6.4.2 Existing baseline conditions were considered with reference to:

- compliance status with EU limit values for 2017, with reference to Defra's PCM model (Ref. 6.19);
- Local Air Quality Management status, with reference to the latest ADC ASR report (Ref. 6.18);
- WSP baseline NO_2 survey; and
- the 2017 modelled existing baseline.

6.4.3 Future baseline conditions were considered in terms of:

- compliance status with EU limit values for 2023, with reference to Defra's PCM model (Ref. 6.19); and
- the 2023 modelled future b$_a$seline.

EXISTING BASELINE

Compliance Status with EU Limit Values

6.4.4 Defra uses the PCM model (Ref. 6.19) in determining compliance with the EU limit value. The PCM model forecasts are periodically updated by Defra. The model includes a sample of approximately 9,000 road links across the UK against which roadside pollutant concentrations are predicted. There are 85 PCM model road links with the WSCC area. One of these road links is within the study area along the A29 between Westergate and Fontwell. All pollutant concentrations are well below the AQS. The 2017 base year roadside annual mean NO_2 concentration is 18.1µg/m^3. According to the PCM model, there were no limit value exceedances within the study area or the wider WSCC area.

Local Air Quality Management Status

6.4.5 The study area is within the ADC administrative boundary. ADC is responsible for LAQM and has not found it necessary to declare an AQMA in the district. ADS in its latest Annual Status Report for 2020 (Ref. 6.18) has reported that *"Air quality monitoring carried out by the Council continues to indicate that there is good air quality within the District, and in particular the air quality objectives for Nitrogen Dioxide (NO_2) are being met. Thus it has not been necessary to declare an AQMA in Arun District."*

6.4.6 **Table 6-13** gives annual mean NO_2 concentrations for the period 2015 to 2019 inclusive from monitoring undertaken by ADC (Ref. 6.18) ~~at the nearest sites to~~ within 2km of the Scheme. The monitoring location~~s are~~ is shown in **Figure 6-2** and ~~are~~ is described by ADC as 'roadside'. The

concentrations are substantially lower than the AQS (40µg/m^3). ADC does not currently monitor PM_{10} or $PM_{2.5}$ concentrations.

Table 6-13 - ADC Monitoring: Annual Mean NO2 (µg/m3) within 2km of the Scheme

Site ID	Description	X	Y	2015	2016	2017	2018	2019
~~Bog 13~~	~~Beachfield Park~~	~~493417~~	~~104374~~	~~21.0~~	~~25.8~~	~~25.7~~	~~28.0~~	~~24.0~~
Barn 20	Barnham Road	495975	104395	-	-	20.7	20.0	18.0

WSP Baseline NO2 Survey

6.4.7 Results of the WSP baseline NO_2 diffusion tube survey are presented in **Table 6-14**. All tubes were placed at roadside locations, shown in **Figure 6-2**. The data have been annualised to the assessment base year of 2017 (**Appendix 6.4**). All concentrations are substantially lower than the AQS (40µg/m3) and are similar to those measured by ADC (**Table 6-13**).

Table 6-14 – WSP Monitoring: Annual Mean NO2 (µg/m3)

Site ID	Description	X	Y	2017
A29x1	A29 Shripney Road, near The Robin Hood PH, Shripney	493746	102481	21.8
A29x2	Entrance to Lidsey Caravan Park 10m back from A29	493884	102922	15.2
A29x3	A29 Lidsey Road, near Wood Gate Road, Woodgate	493805	104172	23.5
A29x4	A29 Westergate Street, near Orchard Gardens, Woodgate	493786	104491	29.4
A29x5	A29 Westergate Street, near Old Manor House B&B, Westergate,	493851	105105	23.3
A29x6	A29 Nyton Road, near Westergate Mews, Westergate,	494003	105579	29.0
A29x7	A29 Nyton Road, opposite Post Office, Eastergate	494349	105593	28.6
A29x8	B2233 Barnham Road, Eastergate	494478	105567	22.7
A29x9	A29 Fontwell Avenue, Eastergate	494620	105989	25.2
A29x10	B2233 Barnham Road, 10m back from road off Church Lane, Eastergate	494960	105276	12.5
A29x11	A29 Fontwell Aveny, near Northfields Farm	494712	106158	29.6

A29x12	A29 Fontwell Avenue, south of roundabout junction with A27	494968	106896	21.2

Modelled Existing Baseline

6.4.8 Modelled annual mean pollutant concentrations for 2017 at receptors are given in **Table 6-15**. All concentrations are well below AQS levels (**Table 6-2**).

Table 6-15 – Modelled Existing Baseline Annual Mean Concentrations (µg/m3)

Receptor	NO2	PM10	PM2.5
E01	17.5	16.4	10.4
E02	26.7	18.2	11.5
E03	26.1	18.1	11.4
E04	17.6	16.5	10.3
E05	23.1	16.9	11.0
E06	21.2	16.3	10.6
E07	22.5	16.8	10.9
E08	26.8	17.7	11.3
E09	25.2	16.8	11.1
E10	20.5	16.1	10.6
E11	15.7	14.8	10.0
E12	11.8	14.1	9.6
E13	16.2	14.9	10.0
E14	19.6	16.2	10.6
E15	14.[1]	15.2	10.0
E16	21.9	[1]6.3	[10].8
E17	18.0	15.6	10.4
E18	17.7	15.6	10.4
E19	19.9	15.6	10.3
E20	20.2	15.7	10.4

FUTURE BASELINE

Compliance Status with EU Limit Values

6.4.9 Using the PCM model, Defra has predicted that concentrations of all pollutants would be lower for 2023 than for 2017. This is based on forecast reductions in vehicle emissions. According to the PCM model, there would be no limit value exceedances within the study area or the wider WSCC area.

Modelled Future Baseline

6.4.10 Modelled annual mean pollutant concentrations for 2023 at receptors are given in **Table 6-16**. All concentrations are well below AQS levels (**Table 6-2**) and are lower than for 2017 – reflecting Defra's forecast reductions in vehicle emissions.

Table 6-16 - Modelled Future Baseline Annual Mean Concentrations (µg/m3)

Receptor	NO2	PM10	PM2.5
E01	14.2	15.8	9.8
E02	20.0	17.5	10.7
E03	19.5	17.3	10.7
E04	13.7	15.6	9.5
E05	17.5	16.1	10.2
E06	15.8	15.4	9.8
E07	16.5	15.8	10.0
E08	19.6	16.8	10.5
E09	19.1	16.0	10.3
E10	15.6	15.2	9.8
E11	12.0	13.9	9.2
E12	9.3	13.2	8.8
E13	12.1	13.9	9.2
E14	14.2	15.1	9.7
E15	10.9	14.3	9.2
E16	17.0	15.6	10.0
E17	14.0	14.8	9.6
E18	13.8	14.8	9.6
E19	15.4	14.8	9.6

E20	15.6	15.0	9.7

SENSITIVE RECEPTORS

Construction Stage

6.4.11 **Figure 6-3** shows all receptors within 200m of the assumed construction area for the Scheme. The DMRB methodology considers all receptors within 50m to have high sensitivity to construction dust. Between 50m and 100m receptors may be considered to have high or low sensitivity depending on the nature of the Scheme. Beyond 100m all receptors are considered to have low sensitivity.

Operational Stage

6.4.12 **Figure 6-4** shows the selected sensitive receptors (detailed previously in **Table 6-10**) within 200m of the ARN. These receptors include predominantly residential properties which were considered to have high sensitivity to potential local air quality impacts.

ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION STAGE IMPACTS

<table>
<tr><th>Assessment Component</th><th>Commentary</th></tr>
<tr><td>Impact of Construction Dust</td><td>Receptors that could be affected during Construction Stage are shown in Figure 6-3. The majority of these are residential properties. The Scheme is considered to have a ‘large’ construction dust risk potential. The table below gives the number of properties that could be affected and the sensitivity of these receptors.

<table>
<tr><th>Distance (m) from construction activities</th><th>Number of receptors</th><th>Sensitivity of receptors with ‘large’ construction dust risk potential</th></tr>
<tr><td>0-50</td><td>70</td><td>High</td></tr>
<tr><td>50-100</td><td>66</td><td>High</td></tr>
<tr><td>100-200</td><td>146</td><td>Low</td></tr>
</table>

There is likely to be a direct, temporary, short-term, moderate adverse effect at all receptors prior to the implementation of mitigation measures.</td></tr>
<tr><td>Secondary Mitigation</td><td>To minimise the risk of adverse impacts during construction, industry best practice measures are to be employed. Appropriate measures will be specified in the Construction Environmental Management Plan (CEMP). The measures used will depend on the circumstances but may comprise:

Damping down of dry surfaces, in-particular haul roads;
Avoiding/minimising stockpiling of friable materials on-site in open areas;
</td></tr>
</table>

	▪ Locating stockpiles (if necessary) as far away from sensitive receptors as practicable; ▪ Seeding or screening of long-term inactive stockpiles such as topsoil; ▪ On-site speed restrictions to minimise dust entrainment; ▪ Sheeting/covering of lorries carrying potentially dusty materials; ▪ Wheel/chassis cleaning prior to exit onto the public highway; ▪ Requiring all on-site plant to comply with the latest EU emission standards for non-road mobile machinery; and ▪ Requiring all contractor vehicles to be compliant with a minimum Euro emissions standard, for example Euro VI (6).
Residual Effects and Monitoring	The residual effects are likely **direct, temporary, short-term minor** adverse effect on receptors following the implementation of mitigation measures. Overall, the effect is **not significant.** Monitoring to ensure effective implementation of mitigation measures will be required throughout the construction stage. This will be undertaken by regular visual inspections to record the weather and ground conditions, activities taking place, mitigation measures being applied and any evidence of increased dust deposition and soiling in the area surrounding the works.

OPERATIONAL STAGE IMPACTS

Assessment Component	Commentary
Impact of Road Traffic Emissions	All impacts on pollutant concentrations at receptors (shown in **Figure 6-4**) in the opening year (2023) would be negligible. Concentrations of all pollutants would remain well below the AQS. All results are given in **Appendix 6.5**. The most notable impacts would be on annual mean NO_2 concentrations. The highest concentration of 19.9µg/m3 with the Scheme would occur at receptor E02 (A29 Shripney Road at north end of Shripney village). The greatest increase would be 1.2µg/m3 at receptors E11 (Green Oaks, B2233 Barnham Road, Eastergate) and E12 (Chantry Mead, Eastergate) where the concentrations with the Scheme would be 13.2µg/m3 and 10.5µg/m3 respectively. The greatest reduction would be -1.3µg/m3 at receptor E16 (A29 Fontwell Avenue at the corner of Collins Close, Eastergate). There is likely to be a **negligible** effect at all receptors.
Secondary Mitigation	No secondary mitigation measures are required.
Residual effects and monitoring	The residual effects are likely to be **negligible** at all receptors without the need for secondary mitigation. Overall, the effect is **not significant**. No monitoring is required.

6.7 LIMITATIONS AND ASSUMPTIONS

6.7.1 To ensure transparency within the EIA process, the following limitations and assumptions were identified:

- The assessment of Construction Stage impacts has relied upon local air quality baseline information, broad assumptions concerning construction stage activities, experience of assessing schemes of a similar nature elsewhere, and professional judgement.
- Computer models (including transport and air quality models) are relatively simplistic representations of highly complex real-world processes which can never be matched with complete accuracy. To address this as far as possible with the scenarios modelled using ADMS-Roads, the outputs of the baseline model for 2017 were compared to monitoring data and adjusted to compensate for the systematic underestimation of concentrations that was apparent.
- In assessing the cumulative Operational Stage impacts, a precautionary approach has been adopted of assuming emissions factors and background concentrations for 2023. It is likely that Phase 2 would not be open until sometime after 2023.

6.8 CUMULATIVE EFFECTS

CONSTRUCTION STAGE

6.8.1 There is potential for cumulative inter-project dust impacts to occur if the construction stage of the Scheme coincides with the construction of adjacent developments. The IAQM has published guidance concerning construction dust impacts for residential and other land developments, which addresses the risk of dust impacts within 350m of the site boundary, and 50m of the public highway used by construction vehicles up to 500m from the site entrance(s) - whereas the DMRB considers dust impacts within 200m of construction activities. The IAQM guidance also differentiates between dust soiling effects on people and property, human health in terms of PM_{10}, and ecological impacts. Whilst the guidance and study areas for road transport infrastructure schemes and land development projects differ, in following the IAQM guidance it is not possible to determine a significant effect due to construction dust at any receptor that is situated beyond 200m from a site or public road under any circumstances as the impacts will always be 'low risk' or 'negligible'. For the Scheme, cumulative dust impacts have therefore been considered where a development is within 400m of the Scheme as beyond this distance the cumulative impact is unlikely to give rise to a significant effect – even without mitigation.

6.8.2 As set out in **Chapter 14: Cumulative Effects** (Table 14-1) committed developments with the potential for inter-project (in-combination) effects have been identified. **Table 6-17** sets out the assessment of the inter-project construction dust impacts for committed development within 400m of the Scheme, and comments on the likely significance of the cumulative effect.

Table 6-17 – Assessment of Inter-Project Construction Dust Impacts and Cumulative Effect

Committed Development	Distance	Assessment of Effect
Land at Former Eastergate Fruit Farm (4)	300m (west)	There is the potential for dust impacts from construction activities to overlap, however timescales and activities for construction works are not known at this stage. Provided that industry best practice measures to prevent and control emissions are used by the contractor for the committed development then cumulatively there is unlikely to be a significant effect.

Land West of Fontwell Avenue (16)	200m (north)	The construction programme for the Scheme (Chapter 3: Description of Scheme, Table 3-1) is 12 months. The committed development does not have planning permission currently, and timescales and activities for construction works are not known. Therefore, it is not anticipated that construction works would overlap. On this basis, cumulatively there would be no significant effect.
Arun District Strategic Housing Allocation (17)	Adjacent / within the site	There is the potential for dust impacts from construction activities to overlap, however timescales and activities for construction works are not known at this stage. Provided that industry best practice measures to prevent and control emissions are used by the contractor for the committed development then cumulatively there is unlikely to be a significant effect.
Barratts Development "Adjacent Proposed Scheme" (19)	Adjacent / within the site	There is the potential for dust impacts from construction activities to overlap, however timescales and activities for construction works are not known at this stage. Provided that industry best practice measures to prevent and control emissions are used by the contractor for the committed development then cumulatively there is unlikely to be a significant effect.

OPERATIONAL STAGE

6.8.3 With the Scheme and Phase 2, the cumulative air quality impacts at existing receptors and committed development areas within 200m would be slight adverse at worst, and would not give rise to a significant effect. This is demonstrated at existing receptors E11 (Green Oaks, B2233 Barnham Road, Eastergate) and E12 (Chantry Mead, Eastergate) where annual mean NO_2 concentrations are predicted to be 15.5µg/m^3 and 12.2µg/m^3 respectively compared 12.0µg/m^3 and 9.3µg/m^3 respectively without the Scheme. These concentrations are well below the AQS of 40µg/m^3. Impacts on PM_{10} and $PM_{2.5}$ concentrations would be negligible. Full details are given in Appendix 6.6.

6.9 SUMMARY

Table 6-18 provides a summary of the findings of the air quality assessment.

Table 6-18 - Summary of Effects for Air Quality

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Construction Stage				
Changes in levels of dust and fine particulates at existing receptors due to on-site construction activities	Human Receptors within 200m from construction works	Minor -/T/D/ST	Section 6.6. Table 6-14 provides a list of mitigation measures to be in place	Negligible and Not Significant ST
Changes in ambient NO_2, PM_{10} and $PM_{2.}$concentrations at existing receptors from NRMM and construction traffic emissions.	Human Receptors within 200m from construction works and roads carrying traffic	Minor -/T/D/ST	Section 6.6. Table 6-14 provides a list of mitigation measures to be in place	Negligible and Not Significant ST
Operational Stage				
Changes in NO_2, PM_{10} and $PM_{2.}$concentrations at existing receptors due to emissions from road traffic associated with the Scheme.	Existing human receptors (Table 6.13).	Negligible LT	No mitigation measures	Negligible and not Significant LT

Key to table:

+ / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, S_T / MT / $_{LT}$ = Short Term, Medium Term or Long Term, N/A = Not Applicable

6.10 REFERENCES

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- Ref. 6.2: The Environment Act 1995, ch.25
- Ref. 6.3: The Air Quality (England) Regulations 2000, No.928
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- Ref. 6.6: The Air Quality Standards (AQS) (Amendment) Regulations, No. 1184
- Ref. 6.7: Department for Environment Food and Rural Affairs. Air quality plan for nitrogen dioxide (NO2) in UK (2017). Available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017 (accessed August 2020)
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- Ref. 6.23: Department for Environment Food and Rural Affairs. NOx to NO2 Calculator, version 7.1 (April 2019). Available at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc (accessed June 2020)

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