A303 Sparkford to Ilchester Dualling Scheme TR010036

6.1 Environmental Statement Chapter 5 Air Quality

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A303 Sparkford to Ilchester Dualling Scheme

Development Consent Order 201[X]

6.1 Environmental Statement
Chapter 5 Air Quality

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5 Air Quality

5.1 Introduction

5.1.1 This chapter considers the likely significant effects of the proposed A303 Sparkford to Ilchester Dualling scheme (hereafter referred to as 'the scheme') on air quality.

5.1.2 The scheme has the potential to cause both adverse and beneficial effects. The air quality topic encompasses 2 sub-topics:

- Local air quality, which is concerned principally with emissions of pollutants that are of concern to human health and ecosystems, at a local level.
- Regional impacts, which is concerned with total emissions of pollutants that can disperse over longer distances, affecting both human health and ecosystems.

5.1.3 This assessment considers both construction and operational phase effects and has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[1] and Interim Advice Notes (IAN) 170/12[2], 174/13[3], 175/13[4] and IAN 185/15[5].

5.1.4 Chapter 2 The Scheme of Volume 6.1 contains a detailed description of the scheme. The drawings referenced in this chapter can be found in Volume 6.2, while the technical appendices are presented in Volume 6.3.

5.2 Competent expert evidence

5.2.1 The competent expert has a master's level degree in Environmental Science and is a member of the Institute of Environmental Sciences and the Institute of Air Quality Management. The competent expert has 10 years of professional

[1] Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, *Air Quality*.
[2] Highways Agency (2012) Interim Advice Note 170/12 v3: *Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3 Part 1 Air Quality* (HA207/07) [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170.pdf (last accessed March 2018).
[3] Highways Agency (2013) Interim Advice Note 174/13. *Update advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ians/pdfs/ian174.pdf (last accessed March 2018).
[4] Highways Agency (2013) Interim Advice Note 175/13 *Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the projection of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian175.pdf (last accessed March 2018).
[5] Highways Agency (2015) Interim Advice Note 185/15. *Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1, Air Quality* (HA207/07) [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf (last accessed March 2018).

experience in the field of air quality including the preparation of Environmental Statement (ES) chapters and has acted as an Expert Witness in Development Consent Order (DCO) applications for other roads schemes.

5.3 Legislative and policy framework

5.3.1 The principal legislative and planning context for the assessment of the environmental effects of the scheme on air quality is presented below.

European legislation

5.3.2 The *EU Directive on ambient air quality (2008/50/EC)*[6] sets out a range of mandatory Limit Values (LV) for different pollutants including nitrogen dioxide (NO_2) and particulate matter less than 10 microns (PM_{10}), the key traffic related pollutants. The directive consolidated previous air quality directives (apart from the Fourth Daughter Directive), setting Limit Values or Target Values for the concentrations of specific air pollutants and providing a new regulatory framework for particulate matter smaller than 2.5µm in diameter ($PM_{2.5}$). It also allows Member States to apply to postpone attainment deadlines.

5.3.3 The Department for Environment Food and Rural Affairs (Defra) assess and reports annually on compliance with the Limit Values (Table 5.1) to the European Commission. For the purposes of their assessment and reporting, the UK is divided in to 43 zones. The status of each zone in relation to a Limit Value is determined within the compliance assessment by the maximum measured or maximum modelled concentrations in the zone. The main pollutants of concern with respect to compliance are NO_2 and PM_{10}. The EU Limit Values are presented in Table 5.1. The *Air Quality (Standards) Regulations 2010* and the *Air Quality Standards (Amendment) Regulations 2016*[7] transpose into English law the requirements of Directives 2008/50/EC on ambient air quality.

5.3.4 EU Limit Values apply throughout the zones and agglomerations. The zone / agglomerations achieve compliance when everywhere within the zone / agglomeration is below the EU Limit Value (although there are exceptions to where the EU Limit Value applies in Annex III of the *Air Quality Directive*, locations where members of the public cannot access, or there is no fixed habitation or industrial premises for instance).

National legislation

5.3.5 Part IV of the *Environment Act*[8] requires the UK Government to produce a national air quality strategy (AQS) which contains standards, objectives and

[6] European Union. (April 2008) *Directive on Ambient Air Quality and cleaner Air for Europe*, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044.
[7] Statutory Instrument (2016) *The Air Quality Standards (Amendment) Regulations, No. 1184*.
[8] Defra (2003) Part IV of the *Environment Act* 1995 *Local Air Quality Management*.

measures for improving ambient air quality. The AQS sets out objectives that are maximum ambient concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.

5.3.6 The ambient air quality standards and objectives are given statutory backing in England through the *Air Quality (England) Regulations 2000*[9] and the *Air Quality (England) (Amendment) Regulations 2002*[10]. The AQS objectives for the protection of human health and applicable to this assessment, are presented in Table 5.1.

Table 5.1: Air Quality Objectives and EU Limit Values for NO2 and PM10 for protection of human health

	Air Quality Objectives			EU Limit Values	
Pollutant	**Concentration**	**Averaging period**	**Compliance date**	**Concentration**	**Compliance date**
NO_2	200 $\mu g.m^{-3}$	1-hour mean (not to be exceeded more than 18 times per year)	31 December 2005	200 $\mu g.m^{-3}$ (18 Exceedances)	1 January 2010
	40 $\mu g.m^{-3}$	annual mean	31 December 2005	40 $\mu g.m^{-3}$	1 January 2010
PM_{10}	50 $\mu g.m^{-3}$	24-hour mean (not to be exceeded more than 35 times per year)	31 December 2010	50 $\mu g.m^{-3}$ (35 Exceedances)	1 January 2005
	40 $\mu g.m^{-3}$	annual mean	31 December 2004	40 $\mu g.m^{-3}$	1 January 2005

5.3.7 The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (in other words where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties, schools, hospitals, and care homes. The 24 hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1 hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

5.3.8 The AQS objectives and EU Limit Values for the protection of vegetation and ecosystems applicable to this assessment, are presented in Table 5.2.

[9] Statutory Instrument. (2000) *Air Quality (England) Regulations, No. 928*.
[10] Statutory Instrument. (2002) *Air Quality (England) (Amendment) Regulations, No. 3043*.

Table 5.2: Air Quality Objectives and EU Limit Value for the protection of vegetation

Pollutant	Air Quality Objectives			EU Limit Values	
	Concentration	Averaging period	Compliance date	Concentration	Compliance date
NO_x	30 µg/m^3	annual mean	31 December 2000	30 µg/m^3	19 July 2001

5.3.9 Local authorities have no legal requirement to comply with AQS objectives. They are however required to demonstrate best efforts to work towards achieving AQS objectives.

5.3.10 Under the Local Air Quality Management (LAQM) regime, local authorities have a duty to make periodic reviews of local air quality against the AQS objectives. Where a local authority's review and assessment of local air quality indicates that AQS objectives are not expected to be achieved, local authorities are required to designate an Air Quality Management Areas (AQMA). An Air Quality Action Plan (AQAP) must then be formulated, outlining a plan of action to meet AQS objectives in the AQMA.

AQS Objectives / EU Limit Values

5.3.11 Whilst AQS Objectives and EU Limit Values are identical in relation to the concentrations that are applied, they are different and it is important to understand how they are interpreted and therefore assessed. Local authorities are required to demonstrate best efforts to achieve the AQS Objectives whereas the UK government is mandatory required to achieve EU Limit Values.

5.3.12 Reporting against compliance with EU Limit Values is undertaken by Defra and reported at a zonal / agglomeration level. Zones / agglomerations only comply when everywhere in the zone is below the EU Limit Value and this is the basis of Defra's reporting, which is designed to determine what the maximum concentration is within the zone and hence determine the date the zone will comply with the Limit Value. AQS Objectives are assessed at a much more local level where an AQMA can be designated as a result of exceedance at individual properties.

5.3.13 The air quality assessment will consider the impacts on both AQS Objectives (does the scheme lead to a significant impact on air quality at individual properties) and EU Limit Values (will the scheme impact on Defra's plans to achieve compliance with the Limit Values).

National policy

National Policy Statement for National Networks

5.3.14 The *National Policy Statement for National Networks*[11] (NPSNN) notes that the applicant should undertake an assessment of the impacts of the proposed scheme as part of the ES and that the ES should describe:

- Existing air quality levels.
- Forecasts of air quality at the time of opening, assuming that the scheme is not built and taking account the impact of the scheme.
- Any significant air quality effects, their mitigation and any residual effects, distinguish between the construction and operation stages and taking account of the impact of road traffic generated by the project.

5.3.15 Paragraphs 5.12 and 5.13 of the NPS NN provides advice for decision makers:

5.3.16 *"5.12 The Secretary of State must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and / or where they lead to a deterioration in air quality in a zone / agglomeration."*

5.3.17 "*5.13 The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will:*

- *Result in a zone / agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant.*
- *Affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision."*

5.3.18 Advice set out in IAN 174/13[12] and IAN 175/13[13] ensures that an assessment to inform the reasonable and robust decision making on the judgements of significant air quality impacts (NPSNN paragraph 5.12) and determining whether a scheme would affect the UK's reported ability to comply with the *Air*

[11] Department for Transport (2014) *National Policy Statement for National Networks* [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf (last accessed March 2018).
[12] Highways Agency (2013) Interim Advice Note 174/13. *Update advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ians/pdfs/ian174.pdf (last accessed March 2018).
[13] Highways Agency (2013) Interim Advice Note 175/13 *Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the projection of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian175.pdf (last accessed March 2018).

Quality Directive (NPSNN paragraph 5.13) can be completed and evaluated in line with the requirements of the NPSNN.

Air Quality Plan for Nitrogen Dioxide in UK

5.3.19 The latest plan for tackling roadside NO_2 concentrations was published by Defra in July 2017 and details the Government's plan to reduce NO_2 concentrations within statutory limits within the shortest possible time[14]. Within this plan, several local authorities with exceedances of the NO_2 limit values are named and therefore are required to undertake a local assessment to consider the best options to achieve compliance with this limit value. While South Somerset District Council is not named within the plan as a local authority with roads with concentrations of NO_2 forecast above legal limits, the plan is relevant in that the scheme should not contradict with the main aim of plan: to achieve compliance with the NO_2 limit values in the shortest time possible.

Local policy

5.3.20 South Somerset District Council adopted its *Local Plan* in March 2015 which sets out the long-term planning framework for the district between 2006 and 2028[15]. The Local plan contains the following policy, Policy EQ7: Pollution Control, which is relevant to air quality:

5.3.21 "*Development that, on its own or cumulatively, would result in air, light, noise, water quality or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other environmental controls, or by measures included in the proposals. This may be achieved by the imposition of planning conditions or through a planning obligation. New development should not exacerbate air quality problems in existing and potential AQMAs. This should include consideration of the potential impacts of new developments and increased traffic levels on internationally designated nature conservation sites, and adopt mitigation measures to address these impacts*."

[14] Defra (2017). *UK plan for tackling roadside nitrogen dioxide concentrations: an overview* [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf (last accessed March 2018).
[15] South Somerset District Council (2015) *South Somerset Local Plan (2006 – 2028) [*online] available at: https://www.southsomerset.gov.uk/media/707200/south_somerset_local_plan_2006-2028_adoption_version_march_2015.pdf (last accessed March 2018).

Highways England policy

5.3.22 The *Highways England Licence*[16], *Highways England Environment Strategy*[17], *Highways England Sustainable Development Strategy*[18], and *Highways England Delivery Plan*[19] contain broad environmental objectives and are therefore of relevance to this chapter. Further information is contained within section 1.5 of Chapter 1 Introduction (Volume 6.1).

5.3.23 Highways England has also published an *Air Quality Strategy*[20] which outlines Highways England's approach to improving air quality as part of the 2015 to 2020 *Road Investment Strategy*[21]. The strategy details different actions to help improve air quality such as:

- Exploring new and innovative approaches to improve air quality, such as air quality barriers.
- Working with key stakeholders such as Department for Transport and Defra to develop and deliver policies to improve air quality.
- Where appropriate, designing out or mitigating poor air quality for Highways England road schemes.
- Improving air quality monitoring across the Highways England road network for example by installing 50 new continuous air quality monitoring stations.
- Working to optimise use of the road network for example by informing customers of alternative routes for journeys to avoid sensitive areas.

5.4 Assessment methodology

5.4.1 This section describes the methodology which has been used for the assessment of air quality, which may be affected by the construction and operation of the scheme.

[16] Department for Transport (April 2015) Highways England: Licence [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/431389/strategic-highways-licence.pdf (last accessed March 2018).
[17] Highways England (2017) *Environment Strategy: Our Approach* [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/605063/Environment_Strategy__21___.pdf (last accessed March 2018).
[18] Highways England (2017) *Sustainable Development Strategy: Our Approach* [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/605079/Sustainable_Development_Strategy_6.pdf (last accessed March 2018).
[19] Highways England (2015) *Highways England Delivery Plan 2015 – 2020* [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/424467/DSP2036-184_Highways_England_Delivery_Plan_FINAL_low_res_280415.pdf (last accessed March 2018)
[20] Highways England (2017) *Our strategy to improve air quality* [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/633933/N160081_Air_Quality_Strategy_Final_V18.pdf (last accessed June 2018).
[21] Highways England *Road Investment Strategy* for the 2015/2016 to 2019/2020 road period [online] available at: https://www.gov.uk/government/publications/road-investment-strategy-for-the-2015-to-2020-road-period (last accessed July 2018).

5.4.2 The scope of the air quality was presented in Chapter 6 Air Quality of the ***Environmental Impact Assessment (EIA) Scoping Report (Document Reference: HE551507-MMSJV-EGN-000-RP-LP-0014)*** submitted to the Planning Inspectorate in November 2017. The Scoping Opinion is contained within Appendix 4.1 of Volume 6.3. A schedule of responses detailing how each of the Scoping Opinion comments have been considered as part of this chapter is contained within Appendix 4.2 of Volume 6.3. Due to updates to the construction information available and to the scheme traffic data, the following amendments to the methodology as presented within the EIA Scoping Report have been necessary:

- Assessment of construction traffic
- Assessment of Stockton Wood and Down Site of Special Scientific Interest (SSSI)

5.4.3 The need to assess construction traffic associated with the scheme has been scoped out of this assessment as the potential effects are not considered to be significant. While the total number of construction vehicles using the local road network is not confirmed (both in terms of HDVs and LDVs associated with workers travelling to and from the site), it is estimated that there would be a maximum of 64 vehicle movements per day associated with earthworks (from the approximate volumes of spoil required to be moved during the earthworks phase). Based on this information, and experience of undertaking assessments on schemes of a similar nature, the maximum total flows associated with the construction phase are not expected to meet the DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[22] criteria described in paragraph 5.6.7. Therefore, potential effects from the scheme's construction traffic are considered to be not significant and have not been assessed further.

5.4.4 The need to assess the NOx concentration at Stockton Wood and Down SSSI as highlighted in the EIA Scoping Report, was based on previous assessments undertaken for the scheme, based on preliminary designs and traffic data. This resulted in the ARN for the scheme extending as far east as this designated site. However, following updates to the traffic modelling for this assessment, the resultant ARN is smaller and the Stockton Wood and Down SSSI is now no longer located within 200 metres of the ARN. In accordance with DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[22], it is therefore not necessary to assess this site and it can be scoped out of this assessment.

5.4.5 The assessment has been undertaken in accordance with the principles set out in Chapter 4 Environmental Assessment Methodology in Volume 6.1. Potential

[22] Highways England (2007) DMRB Volume 11 Section 3 Part 1 HA 207/07 Air Quality [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf (last accessed July 2018).

air quality effects have been assessed in accordance with the DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[23] and the following IANs to a Detailed level:

- IAN 170/12 *Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11, Section 3 Part 1 'Air Quality'* (HA207/07)[24].
- IAN 174/13 *Update advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality'* (HA207/07)[25].
- IAN 175/13 *Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the projection of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'* (HA207/07)[26].
- IAN 185/15 *Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1, 'Air Quality'* (HA207/07)[27].

Construction phase

5.4.6 A qualitative assessment of potential dust effects has been undertaken, based on a review of likely dust raising activities and identification of sensitive receptors within 200 metres of these activities in accordance with DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[23]. In accordance with this, and in the absence of detailed traffic flows for the construction phase, a qualitative assessment has also been undertaken of the likely air quality impact associated with the proposed traffic management measures presented in paragraph 5.6.1. Combustion related emissions (such as NO_2, SO_2 and fine particulates) from on-site plant and vehicles would also occur during the

[23] Highways England (2007) DMRB Volume 11 Section 3 Part 1 HA 207/07 Air Quality [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf (last accessed July 2018).
[24] Highways England (2012) Interim Advice Note 170/12 IAN 170/12 *Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11, Section 3 Part 1 'Air Quality'*[online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170.pdf (last accessed July 2018).
[25] Highways Agency (2013) Interim Advice Note 174/13 *Update advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ians/pdfs/ian174.pdf (last accessed March 2018).
[26] Highways Agency (2013) Interim Advice Note 175/13 *Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the projection of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 Air Quality* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian175.pdf (last accessed March 2018).
[27] Highways England (2015) Interim Advice Note 185/15 *Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11 Section 3, Part 1 'Air Quality' and Volume 11 Section 3 Part 7 Noise* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf (last accessed July 2018).

construction phase and could affect local air quality. However, given the local and temporary nature of site plant and potential effects of emissions on local air quality, the assessment of construction plant emissions has not been considered further. Mitigation measures to reduce the effect of site plant on local air quality are nevertheless discussed in section 5.5.5 of this chapter.

Operational phase – local air quality

Overview

5.4.7 The local air quality assessment focuses on concentrations of air pollutants which have impacts at a local level.

5.4.8 The local air quality assessment has considered emissions of NOx and PM_{10}. $PM_{2.5}$ has not been considered further within the local air quality assessment. This is because:

- the results of the PM_{10} assessment presented in section 5.10 of this chapter and Appendix 5.1 of Volume 6.3 show that predicted concentrations of PM_{10} are well below the equivalent strategy objectives and Target Values set for $PM_{2.5}$ (annual men concentration of 25µg/m^3).
- $PM_{2.5}$ is constituent part of PM_{10} which means vehicles emission factors for $PM_{2.5}$ are lower than those for PM_{10}
- projected background concentrations in the area (see paragraph 5.7.12 for more details) are well below the objective and target values and lower than those for PM_{10}.

5.4.9 Therefore, it can be concluded that there would be no significant effects for $PM_{2.5}$.

Traffic data

5.4.10 Outputs from the SATURN traffic model developed for the scheme, have been used for this assessment. Data on vehicle flows, speed and percent of HDVs are available for the following periods in the base, Do-Minimum and Do-Something scenarios for the scheme:

- AM peak period (07:00 to 10:00).
- Inter-peak period (10:00 to 16:00).
- PM peak period (16:00 to 19:00).
- Off-peak period (19:00 to 07:00).

5.4.11 The diurnal traffic flow characteristics, and therefore emissions, are represented in the dispersion model using time varying emission factors. The same profile used for weekdays has been applied to the weekend as a worst case.

5.4.12 Speed data has also been derived from the SATURN traffic model and has been Speed Banded following application of derived speed pivots in accordance with IAN 185/15[28] for use in this assessment. Appendix 5.2, Volume 6.3 provides a summary of traffic data for the study area.

5.4.13 Committed developments with potential to generate traffic have been incorporated into the traffic model developed for this scheme. Discussion of committed developments included within the traffic model is presented within the ***Combined Modelling and Appraisal (ComMA) Report* (*document reference TR010036/APP/7.7***). The cumulative effect of the scheme with other committed developments included within the traffic model has therefore been accounted for within this chapter for operational effects.

Assessment scenarios

5.4.14 This assessment has considered the following scenarios:

- Base year (2016)
- Do-Minimum (DM) scenario 2023 (opening year)
- Do-Something (DS) scenario 2023

5.4.15 Base year air quality predictions have been used to verify the model against air quality monitoring data (as described in the Appendix 5.3, Volume 6.3). A model verification year of 2016 has been used, in accordance with the scheme-specific monitoring undertaken by Highways England, using 2015 traffic data. Analysis undertaken by the scheme's traffic modelling team using WebTRIS found a negligible change in traffic characteristics on the network between 2015 and 2016. Therefore, it is considered acceptable to use the 2015 traffic flows to represent 2016 for model verification.

5.4.16 The local air quality assessment has compared predicted concentrations against the air quality objectives and assessed compliance with the *Air Quality Directive* for the opening year of the scheme only. The opening year of the scheme is expected to be a worst-case in terms of local air quality impacts, as forecast annual traffic growth along the affected section of the A303 (where greatest traffic and air quality effects arise) is lower than the anticipated annual rate of improvement in air quality. Air quality is predicted to improve in future years in response to the uptake of vehicles which meet more stringent emissions standards[29]. This is described further in the context of the

[28] Highways England (2015) Interim Advice Note 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11 Section 3, Part 1 'Air Quality' and Volume 11 Section 3 Part 7 Noise. [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf (last accessed July 2018).
[29] Defra (2015) *Air Quality in the UK: plan to reduce nitrogen dioxide emissions* [online] available at: https://www.gov.uk/government/publications/air-quality-in-the-uk-plan-to-reduce-nitrogen-dioxide-emissions (last accessed March 2018).

assumptions used in the assessment in paragraphs 5.4.31 to 5.4.35 and is consistent with the approach outlined within DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07).

Model selection

5.4.17 This assessment has used a dispersion model called ADMS-Roads (version 4), a PC-based model of dispersion in the atmosphere of pollutants released from road traffic sources, produced and validated by Cambridge Environmental Research Consultants (CERC).

5.4.18 The dispersion model was built by digitising traffic model links and assigning road widths based on OS mapping. The highway design associated with the Do-Something scenario was digitised based on a geo-referenced CAD drawing of the scheme. Road widths and alignments were adjusted to represent the scheme design.

Vehicle emission factors

5.4.19 Road traffic emission factors for NO_x have been derived from an update to the speed band emission factors published in IAN 185/15[30]. The speed band emission factors used in this assessment where updated by Highways England following the release of Defra's Emissions Factors Toolkit (EFT) v8.0[31] in December 2017. Emissions have been defined according to the speed band category of the traffic link or road.

5.4.20 Although IAN 185/15[30] provides predictions of future emissions, there remains some uncertainty over these forecasts, particularly regarding emissions from Euro 6/VI vehicles in urban driving conditions. This uncertainty has been addressed through applying long term trend gap analysis factors to uplift opening year concentrations, as described in paragraphs 5.4.31 to 5.4.35.

5.4.21 A time varying emission file has been used to represent vehicle emissions for each of the traffic periods discussed in paragraph 5.4.10. The same emissions profile was used for weekdays and weekends in order to assess a worst case.

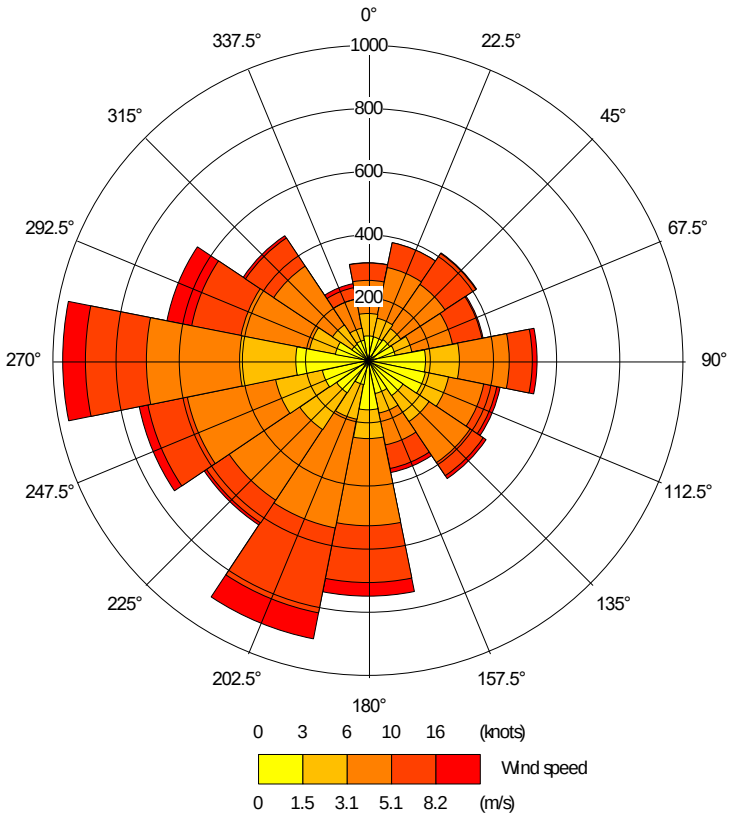
[30] Highways England (2015) Interim Advice Note 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11 Section 3, Part 1 'Air Quality' and Volume 11 Section 3 Part 7 Noise. [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf (last accessed July 2018).
[31] Defra (2017). Emissions Factors Toolkit (version 8.0.1). [online], available at: https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html (last accessed March 2018)

Meteorological data

5.4.22 The most important meteorological parameters governing the atmospheric dispersion of emissions are wind direction, wind speed and atmospheric stability.

5.4.23 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. There are only a limited number of sites where the required meteorological measurements are made. Data for 2016 from Yeovilton Air Station, approximately one kilometre from the scheme, was used within the assessment and is considered representative of the modelled area due to its close proximity to the scheme. A wind rose is presented in Figure 5.1 and highlights predominant wind directions from the west and south-south-west, which are associated with the highest wind speeds. There are lower occurrences of wind from other directions and these tend to be associated with lower wind speeds.

Figure 5.1: Wind rose for Yeovilton (2016)



*Note: the diagram indicates the number of hours that the wind was blowing from each direction.

NO_x to NO_2 relationship

5.4.24 Emission rates used within dispersion modelling are based on NOx to represent all nitrogen-oxygen species emitted in exhaust gases. The proportion of NO_2 is needed for comparison with the air quality objectives presented in Table 5.1.

5.4.25 In accordance with Defra guidance[32], modelled road-traffic NO_x has been converted to annual mean NO_2 using the Defra 'NO_x to NO_2' calculator[33], assuming traffic mix 'all non-urban UK traffic'.

Background concentrations

5.4.26 Total air pollutant concentrations comprise a background and local component; both of which have to be independently considered for the air quality assessment. The background component is determined by regional, national and international emissions, and often represents a significant proportion of the total pollutant concentration. The local component is affected by emissions from sources such as roads and chimney stacks, which are less well mixed locally, and add to the background concentration.

5.4.27 Only road traffic emission sources have been explicitly included within the dispersion model. Non-road traffic related emission sources, such as industrial and domestic emissions, have been accounted for within the assessment by assigning appropriate 'background' concentrations to modelled receptor locations.

5.4.28 A comparison between Defra background and monitored NO_2 and NO_x has been undertaken for the Defra Automatic Urban and Rural Network (AURN) rural background site at Charlton Mackrell, which is the closest background monitoring site to the scheme and therefore representative of background concentrations in the study area. The results from this comparison is presented below in Table 5.3.

5.4.29 In 2016, Defra background concentrations are lower than the monitored background concentrations at Charlton Mackrell. Background concentrations are relatively low across the study area and small differences in absolute concentrations between the Defra backgrounds and the monitored data can result in concentrations being underpredicted at receptors Therefore, the Defra NO_x and NO_2 background concentrations applied to this assessment have been uplifted by a factor of 1.21 and 1.22 respectively, to improve the agreement with concentrations monitored at the AURN site.

[32] Defra (2016) Part IV of the *Environment Act* 1995, *Environment (Northern Ireland) Order 2002 Part III: Local Air Quality Management – Technical Guidance* LAQM.TG (16). [online] available at http://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf (last accessed March 2018).
[33] Defra (2017) NO_x to NO_2 Calculator, Version 6.1 [online] available at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc (last accessed March 2018).

Table 5.3: Comparison of monitored background NO_2 concentrations and Defra background pollutant map data

Data source	2016 NO_2 concentration ($\mu g/m^3$)	NOx concentration ($\mu g/m^3$)	Annual data capture (%)
Charlton Mackrell (Defra AURN monitoring)[(a)]	7.4	9.4	99%
Defra Background at Charlton Mackrell[(b)]	6.0	7.8	-

Notes: [(a)] – Located at 352196,128768.
[(b)] – Grid square 352500,128500.

Assessment of 1 hour NO_2 concentrations

5.4.30 Defra's Technical Air Quality guidance (TG16)[34] advises that exceedances of the 1 hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or above. Therefore, exceedances of 60µg/m^3 as an annual mean are used as an indicator of potential exceedances of the 1 hour mean NO_2 objective.

Assessment of future NOx and NO_2 projections

5.4.31 The Defra background pollution maps and vehicle emission factors assume that air quality improves in future years, as older vehicles are replaced with modern cleaner vehicles (amongst others)[35]. However, generally, UK monitored roadside and background NO_2 concentrations have not declined as would be expected in recent years. This trend is thought to be related to the increased use of modern diesel vehicles, which emit more NO_x than expected under urban driving conditions and have higher primary NO_2 emissions than petrol vehicles[36].

5.4.32 IAN 170/12[37] provides advice on taking account of the effect of future alternative NO_2 projections. The IAN is in response to Defra's advice on long-term trends that there is a gap between current projected vehicle emission improvements and projections on the annual rate of improvements in ambient air quality, as previously published in Defra's technical guidance.

[34] Defra (2018) Part IV of the *Environment Act* 1995, *Environment (Northern Ireland) Order 2002 Part III: Local Air Quality Management – Technical Guidance LAQM.TG* (16) [online] available at https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf (last accessed March 2018).
[35] Defra (2015) *Air Quality in the UK: plan to reduce nitrogen dioxide emissions* [online] available at: https://www.gov.uk/government/publications/air-quality-in-the-uk-plan-to-reduce-nitrogen-dioxide-emissions (last accessed March 2018).
[36] Defra (2016) *Trends in NOx and NO_2 emissions and ambient measurements in the UK* [online] available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat05/1108251149_110718_AQ0724_Final_report.pdf (last accessed March 2018).
[37] Highways England (2012) Interim Advice Note 170/12 *Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11 Section 3 Part 1 'Air Quality' [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170.pdf (last accessed July 2018).*

5.4.33 The assessment of local air quality NO_2 effects has been undertaken in accordance with IAN 170/12. The IAN describes 3 potential approaches for future projections of NOx and NO_2 and requires professional judgement to be used to determine the most appropriate approach.

5.4.34 Determining the most appropriate approach requires consideration of the following aspects:

- Trends in ambient background and roadside NO_2 concentrations in the study area in recent years.
- How far in to the future the opening year of the proposed scheme is. This relates to the proportion of vehicles on the road network in the opening year which would be subject to more stringent European emission standards and the degree to which national reductions in emissions of NOx (particularly from road transport) can be expected to reduce ambient NO_2 concentrations. The interim alternative long term trend projections approach (LTT_{E6}) assumes there is a greater reduction in emissions compared to the long term trend projections approach (LTT)[38] due to the expected benefit of Euro 6/VI vehicles entering the fleet.

5.4.35 The baseline air quality presented in section 5.7 of this chapter and in Appendix 5.4, Volume 6.2 demonstrates that there is an overall slight decreasing trend in annual mean NO_2 concentrations in the study area between 2013 and 2017. In addition, considering the opening year is expected to be 2023, there would be an increased uptake of new Euro VI/6 compliant vehicles, which came into force in 2014. Therefore, Highways England's LTT_{E6} has been used within the assessment.

5.4.36 It is important to note that the LTT_{E6} gap analysis factors have been developed based on a precautionary approach, derived by assuming the mid-point between LTT and the forecast that would be produced if LTT fully realised the future benefits of Euro 6/VI vehicles (in other words they fully meet emissions standards). Uncertainty in Euro 6/IV emissions performance is therefore built into LLT_{E6}.

[38] Highways England (2012) Interim Advice Note 170/12 v3: *Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3 Part 1 'Air Quality'* (HA207/07) [online] available at http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170.pdf (last accessed July 2018).

Human health receptors

5.4.37 The air quality objectives only apply in locations of relevant exposure. Therefore, receptors have been chosen following the advice set out in Defra TG16. A total of 21 worst-case receptors were selected for the assessment, consisting of 20 residential receptors and 1 school, as shown in Table 5.4 below. Receptors were selected using professional judgement to determine where the highest pollutant concentrations would be likely to arise, and where the greatest effects would be expected to occur due to the proposed scheme. Figure 5.4 in Volume 6.2 shows the location of these receptors in relation to the ARN.

Table 5.4: Local air quality assessment human health receptors

Receptor ID	Receptor name	Receptor type	X	Y	Z
1	The Hollies	Residential	357084	125028	1.5
2	Crusty Cottage	Residential	357668	125298	1.5
3	The Firs	Residential	357827	125398	1.5
4	Pepperhill Cottage	Residential	358964	125601	1.5
5	Spring Lodge	Residential	367652	127050	1.5
6	Halfway House	Residential	348490	119361	1.5
7	Foss Way	Residential	346609	117711	1.5
8	Plowage Lane	Residential	357118	125247	1.5
9	Hill View	Residential	359776	125218	1.5
10	Bridge House Park	Residential	344674	116536	1.5
11	Townsend	Residential	349737	120428	1.5
12	Ilchester Community Primary School	School	352201	123901	1.5
13	Podimore Road	Residential	354626	125098	1.5
14	Sparkford Road	Residential	360585	126532	1.5
15	Rowan Close	Residential	371546	127966	1.5
16	The Beeches	Residential	381795	132848	1.5
17	Silton Road	Residential	378036	130635	1.5
18	The Witches	Residential	359584	124914	1.5
19	Hazel Grove Lodge	Residential	360039	125934	1.5
20	Wolfester Terrace	Residential	359975	125782	1.5
21	The Beeches Viaduct	Residential	381795	132848	0

Assessment of ecological designated sites

5.4.38 Elevated NO_x concentrations can adversely affect ecosystems, including those designated as Special Areas of Conservation (SACs), Special Protected Areas (SPAs), SSSI and Ramsar sites (hereafter collectively referred to as designated sites). Assessment of exposure to NO_x has included the following key stages (in

accordance with the DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07)[39] methodology):

- Identification of all designated sites within 200 metres of roads 'affected' by the scheme which have designated features sensitive to air pollutants, directly or indirectly.
- Calculation of annual average NOx concentrations at the designated sites with and without the scheme.

5.4.39 IAN 174/13[40] requires that where designated sites exceed the annual mean NO_x objective of 30µg/m^3 and changes in NO_x concentrations are greater than 0.4µg/m^3 then nutrient nitrogen deposition should also be calculated and used to help determine the significance of a scheme effect.

Ecological receptors

5.4.40 There are 2 designated sites within 200 metres of the ARN of the scheme:

- Charnage Down Chalk Pit SSSI
- Whitesheet Hill SSSI

5.4.41 Of these 2 sites, only Whitesheet Hill SSSI is sensitive to NO_x and nitrogen deposition; it has been designated for the presence of chalk grassland which supports many notable, and in some cases rare, species of flora. Charnage Down Chalk Pit SSSI is designated for geological reasons so is not considered sensitive to air pollution and therefore has not been considered further in this assessment.

5.4.42 Figure 5.4 in Volume 6.2 presents the location of the nearest point of the Whitesheet Hill SSSI to the ARN, which is approximately 150 metres from the A303.

Assessment criteria for human health receptors

5.4.43 IAN 174/13 provides advice for evaluating significant local air quality effects for public exposure and designated sites. Evaluation of the significance of local air quality effects has been undertaken in accordance with IAN 174/13, a summary of which is provided here.

5.4.44 The difference in pollutant concentrations between the Do-Minimum and Do-Something scenario is used to describe the 'magnitude' of change in

[39] Highways England (2007) DMRB Volume 11 Section 3 Part 1 HA 207/07 *Air Quality* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf (last accessed July 2018).
[40] Highways England (2013) Interim Advice Note 174/13 *Updated advice for evaluating significant local air quality effects for users of DRMB Volume 11 Section 3 Part 1 'Air Quality' (HA 207/07)* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf (last accessed July 2018).

accordance with Table 5.5. The larger the magnitude of change, the more certainty there is that there will be an impact as a result of a proposed scheme. Where the scheme impact on concentrations is less than 1% of the air quality threshold, then the change at these receptors is considered to be imperceptible, and these receptors are scoped out of the judgement on significance.

Table 5.5: Magnitude of change criteria

Magnitude of change in concentration (µg/m³)	Value of change in annual average NO_2
Large (>4)	Greater than full MoU value of 10% of the air quality objective (4µg/m3).
Medium (>2)	Greater than half of the MoU (2 µg/m3), but less than the full MoU (4 µg/m3) of 10% of the air quality objective.
Small (>0.4)	More than 1% of objective (0.4 µg/m3) and less than half of the MoU that is, 5% (2 µg/m3). The full MoU is 10% of the air quality objective (4 µg/m3).
Imperceptible (<= 0.4)	Less than or equal to 1% of objective (0.4 µg/m3).

Notes: MoU = Measure of Uncertainty (10% of the objective)

Source: IAN 174/13

5.4.45 Only receptors which exceed the air quality objective in either the Do-Minimum or Do-Something scenarios are used to inform significance. The total number of receptors in each magnitude band which exceed the air quality objective are then aggregated and compared to the guideline number of receptors constituting a significant effect as shown in Table 5.6.

5.4.46 The guideline bands have been developed for each magnitude category and set the upper level of likely non-significance and the lower level of likely significance. Between these 2 levels are the ranges where likely significance is more uncertain, and therefore professional judgment would be required.

Table 5.6: Guideline to number of properties constituting a significant effect

Magnitude of change in concentration	Number of receptors with: worsening of air quality objective already above objective or creation of a new exceedance	Number of receptors with: improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4)	1 to 10	1 to 10
Medium (>2 to 4)	10 to 30	10 to 30
Small (>0.4 to 2)	30 to 60	30 to 60

Source: IAN 174/13

5.4.47 If a scheme effect is above the lower level of likely significance, consideration should be given to all the evidence that may support or detract from the conclusion of a significant effect, as discussed in section 3.1 of IAN 174/13[41] and presented in paragraph 5.4.55. Where no exceedances of air quality

[41] Highways England (2013) Interim Advice Note 174/13 *Updated advice for evaluating significant local air quality effects for users of DRMB Volume 11 Section 3 Part 1 'Air Quality' (HA 207/07)* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf (last accessed July 2018).

objectives are predicted at receptors, IAN 174/13 states that the air quality effects are unlikely to be considered significant.

Assessment criteria for ecological receptors

5.4.48 Increases in NOx concentrations at designated sites as a result of the scheme could be potentially significant, and therefore require further assessment, if:

- The scheme is predicted to cause an increase in annual mean NOx concentrations of 0.4 µg/m^3, and
- Predicted concentrations (including background) exceed the criterion of 30µg/m^3

5.4.49 In accordance with IAN 174/13, if this criteria is exceeded, further assessment is required in the form of calculating the changes in nitrogen deposition and discussing the findings with an ecologist prior to agreeing the outcomes with Natural England.

Compliance with the EU Directive on Ambient Air Quality

5.4.50 IAN 175/13 provides guidance in relation to the assessment of the risk of the scheme affecting reported compliance with the *Air Quality Directive*. The compliance risk assessment is undertaken using the model results obtained from the local air quality assessment. To undertake the compliance risk assessment the following information is required:

- Local air quality modelled results.
- Defra's Pollution Climate Mapping (PCM) model outputs for the compliance road network.
- Defra's zones and agglomeration maps.

5.4.51 Defra uses the PCM model to report compliance with the *Air Quality Directive* (EU Directive 2008/50/EC). PCM projections are available for all years from 2017 to 2030 from the base year of 2015. In general, NO_2 concentrations decline into the future, mainly in response to cleaner vehicles and technologies, and actions in Defra's Air Quality Action Plan. The most recent PCM model was published in August 2017.

5.4.52 To determine the study area for the compliance risk assessment, the local air quality study area is compared to the compliance risk road network in the PCM model. A compliance risk road network (CRRN) is then defined where the 2 networks intersect, which then forms the basis for the assessment of compliance risk for an individual scheme.

5.4.53 In the scheme opening year (2023) there are no PCM links which overlap with the scheme's ARN (see Figure 5.6, Volume 6.2). The PCM link closest to the

scheme (approximately 7 kilometres south of the scheme on Ilchester Road) predicts a 2023 annual NO_2 concentration of 15.6µg/m^3, which is well below the annual mean limit value of 40µg/m^3 for NO_2.

5.4.54 The scheme is therefore considered to have a low compliance risk rating, in accordance with IAN 175/13, and no further consideration of scheme effects in relation to compliance with the EU Directive has been undertaken. The scheme is therefore considered to meet the policy tests set out in the NPSNN.

Overall judgement of significance for local air quality effects

5.4.55 The information compiled to complete Table 5.5 and Table 5.6 is then used along with the following key criteria, as stated in IAN 174/13, to determine the overall evaluation of local air quality significance:

- Is there a risk that environmental standards will be breached?
- Is there a high probability of the effect occurring?
- Will there be a large change in environmental conditions?
- Will the effect continue for a long time?
- Will many people be affected?
- Is there a risk that protected sites, areas, or features will be affected?
- Will it be difficult to avoid, or reduce, or repair, or compensate for the effect?

Operational phase - regional air quality

5.4.56 Following DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07) guidance, quantification of changes in emissions of NO_x, PM_{10} and carbon dioxide (CO_2) has been undertaken as it is recognised that these pollutants can travel longer distances, and have impacts on a regional, national or international scale. The quantification has been carried out for the scheme for the following scenarios, based on the ARN defined in section 5.6:

- DM Scenario 2023 (opening year)
- DS Scenario 2023
- DM Scenario 2038 opening year plus 15 years)
- DS Scenario 2038

5.4.57 Vehicle emission factors are not available beyond 2030 and consequently, emission factors for 2030 have been used for 2038.

Consultation

5.4.58 Consultation was undertaken with the Environmental Health Officers from South Somerset District Council as part of the Environmental Technical Working Group (TWG). The methodology, the study area and the air quality assessment

findings were discussed. Minutes from this meeting are presented in Appendix 4.9 of Volume 6.3.

5.4.59 Natural England were also consulted regarding whether there were any sensitive ecological sites, in addition to those already identified within the ***Environmental Impact Assessment (EIA) Scoping Report (Document Reference: HE551507-MMSJV-EGN-000-RP-LP-0014)***, which required inclusion within the assessment. The outcome of this consultation was that no additional ecological sites required inclusion within the air quality assessment.

5.5 Assessment assumptions and limitations

5.5.1 The air quality assessment has been based on the description of the scheme detailed in section 2.5 of Chapter 2 (Volume 6.1), including the horizontal and vertical limits of deviation.

5.5.2 The air quality modelling predictions are based on the most reasonable, robust and representative methodologies. However, there is an inherent level of uncertainty associated with the model predictions, including:

- Uncertainties with model input parameters such as surface roughness length (defined by land use) and minimum Monin-Obukhov length (used to calculate stability in the atmosphere).
- Uncertainties with traffic forecasts.
- Uncertainties with vehicle emission predictions.
- Uncertainties with background air quality data.
- Uncertainties with recorded meteorological data.
- Simplifications made in the model algorithms or post processing of the data that represent atmospheric dispersion or chemical reactions.

5.5.3 In order to best manage these uncertainties, the air quality model has been evaluated using the results from air quality monitoring to verify model outputs. This model verification process has been undertaken in line with Defra TG16 guidance. It does this by comparing modelled and monitored pollutant concentrations and if necessary adjusting the model output to account for systematic bias. The adjustment factor derived in the model variation has then been added to the modelling outputs for the opening year of the scheme.

5.5.4 Following the verification process for this scheme, an overall Root Mean Square Error value of less than 10% is achieved, which is considered robust according to Defra TG16 guidance. On this basis, the modelled results are considered appropriate to allow a robust professional judgement of significance to be determined. The model verification for this scheme is presented in Appendix 5.3, Volume 6.3.

5.5.5 In addition, uncertainty related to vehicle emissions and therefore NO_x and NO_2 projections has been addressed through the use of IAN 170/12[42].

5.6 Study area

Construction phase

5.6.1 During the construction phase, the scheme would introduce new emission sources in the form of site plant, traffic from construction vehicles and the implementation of traffic management measures, as detailed in the Outline Traffic Management Plan (TMP) (Annex B.5 of the ***OEMP***, ***document reference TR010036/APP/6.7***), including the following which are specific to air quality considerations:

- Temporary road closures and diversions from Sparkford to Podimore and Wincanton to Sparkford and on local side roads (Steart Hill, Howell Hill, Plowage Lane, Downhead Lane, B3151 Yeovilton Road and Podimore Road)
- Permanent local road closures at the points where local roads join with the A303 (Traits Lane and Gason Lane).
- Single file traffic along the existing carriageway for the duration of works (approximately 2.5 years).
- Speed limit reduction to 40 miles per hour from 50 miles per hour on the existing A303 between the Podimore Roundabout and Hazlegrove Roundabout (junction with the A359).
- Stepped speed limits on the approaches to the Podimore and Hazlegrove Roundabout of 40 and 50 miles per hour from 70 miles per hour.

5.6.2 As identified in DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07), these traffic management measures have the potential to affect air quality at properties and Designated sites within 200 metres of those locations. Appendices H.1 to H.10 in the Outline TMP (Annex B.5 of the ***OEMP***, ***document reference TR010036/APP/6.7***) shows the locations of these traffic management measures.

5.6.3 In addition, during the construction phase there would be potentially dust generating activities, such as earth moving and demolition. The distances from the emission source at which significant construction dust effects are likely to occur are dependent on the extent and nature of mitigation measures, the

[42] Highways England (2012) Interim Advice Note 170/12 *Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11 Section 3 Part 1 'Air Quality'* [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170.pdf (last accessed July 2018).

prevailing wind conditions, rainfall and the presence of screening. However, research indicates that effects from construction activities that generate dust are generally limited to within 150 - 200 metres of the construction site boundary[43].

5.6.4 Following the advice set out in paragraph 3.45 of DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07), sensitive features within 200 metres of any construction activities and site compounds have been identified. A total of 177 residential receptors and no designated sites were identified. The construction phase study area for the scheme is presented within Figure 5.1, Volume 6.2.

Operational phase

Local air quality

5.6.5 During the operational phase, the scheme would alter parts of the existing road network through the creation of a new dual carriageway adjacent to the existing A303 between Sparkford and Ilchester and by introducing new junctions at Hazlegrove and Downhead. This would move emission sources closer to some receptors and further away from others in the vicinity of the scheme. In addition, the scheme would change the characteristics of traffic flows on the existing road network as the scheme is predicted to increase capacity of the A303 between Sparkford and Ilchester.

5.6.6 In accordance with paragraph 3.12 of DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07), the following criteria have been applied to the scheme Do-Minimum and Do-Something scenario traffic flows. These criteria have been used in order to identify which roads are likely to be affected by the scheme (referred to as affected roads) to a degree that they require consideration within the local air quality assessment.

5.6.7 The criteria are:

- road alignment would change by 5 metres or more.
- daily traffic flows would change by 1,000 Annual Average Daily Traffic (AADT) flow or more.
- Heavy Duty Vehicle (HDV)[44] flows would change by 200 AADT or more.
- daily average speed would change by 10 kilometres per hour or more.
- peak hour speed would change by 20 kilometres per hour or more.

5.6.8 Following a review of traffic data for the opening year (2023) of the scheme, the affected roads identified for the local air quality assessment include the section of the A303 between Ilminster and West Knoyle (which is a distance of

[43] Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, *Air Quality*.

[44] HDVs are defined as vehicles with a gross vehicle weight above 3.5 tonnes.

approximately 60 kilometres) and some local roads surrounding the scheme. These affected roads (the affected road network (ARN)) are located within the area of detailed traffic simulation and are presented in Figure 5.2, Volume 6.2. Modelled traffic data used for this assessment to determine the ARN has been provided in Appendix 5.2, Volume 6.3 and Figure 5.3 (sheets 1 to 10), Volume 6.2.

5.6.9 The majority of roads in the ARN have been triggered by traffic changes greater than 1,000 AADT and these primarily occur along the A303. Increases of approximately 2,000 to 4,000 AADT are predicted on the A303 between Stoke Sub-Hamdon and Leigh Common. These changes are due to increased capacity and reduced congestion on this section of the A303 as a result of the scheme. The scheme creates a new section of dual carriageway which bypasses the existing Hazlegrove Roundabout at Sparkford which is a pinch point with high traffic congestion, making this section of the A303 more favourable route once the scheme is operational.

5.6.10 The local road network is predicted to experience a maximum decrease of approximately 1,000 AADT along the A359 on High Street in Queen Camel. These changes are predicted due to the rerouting of traffic away from the local road network onto the A303.

5.1.1 There are predicted changes in speed on the existing A303 between Sparkford and Podimore which will remain open as a local road once the new scheme is operational. The speed changes on this road increase as there would be reduced traffic when it becomes a local road. The largest of these are an increase of approximately 33km/hr (as a daily average) on the Sparkford roundabout and an increase of 21km/hr (as a daily average) on the existing A303 near where the B3151 joins the A303.

5.6.11 The assessment has considered the effects at sensitive human health receptors (residential properties and schools) and designated sites for ecology within 200 metres of affected roads, as presented in Figure 5.4, Volume 6.2. Details of the receptors modelled can be found in Table 5.4 in section 5.4 of this chapter. A total of 21 human health receptors were selected from the 1,922 sensitive receptors located within 200m of the ARN as these were the receptors likely to experience the worst case impact as a result of the scheme.

5.6.12 Additional road links within 200 metres of affected roads have been included in the air quality dispersion model where their emissions contribute to total concentrations at identified receptors. These are presented in Figure 5.2, Volume 6.2 and this approach is consistent with DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07).

Regional air quality

5.6.13 The study area for the regional air quality assessment is defined by the traffic impacts of the scheme in the opening year (2023) and design year (2038). Under DMRB Volume 11 Section 3, Part 1 – *Air Quality* (HA207/07) guidance, affected roads are defined where:

- daily traffic flows (AADT) will change by more than 10%.
- HDVs will change by more than 10%.
- daily average speed will change by more than 20 kilometres per hour.

5.6.14 The ARN identified for the regional air quality assessment is shown in Figure 5.5 Volume 6.2. A number of road links considered in the regional air quality study area are outside the detailed simulation area of the traffic model defined by the scheme's traffic consultants. However, following discussions with the scheme's traffic consultants, it is considered appropriate to include the flows on triggered roads outside the detailed simulation area within the regional air quality assessment as all of these roads are part of the strategic road network and are expected to experience a change in traffic flows due to the scheme. Although outside the detailed simulation area, these roads have been sufficiently validated within the South West Regional Traffic Model and the predicted flows are considered to be suitable for inclusion in the regional assessment.

5.7 Baseline conditions

5.7.1 Information on air quality in the UK can be obtained from a variety of sources including local authorities, national network monitoring sites and other published sources. For the purpose of this assessment, data has been obtained from South Somerset District Council, Defra and a scheme specific monitoring survey undertaken on behalf of Highways England. The most recent full year of monitoring data available is for 2017.

South Somerset District Council review and assessment

5.7.2 In 2002/3, South Somerset District Council declared an AQMA in Yeovil due to monitored and modelled exceedances of the NO_2 annual mean air quality objective. These exceedances were primarily associated with the A30 and A37 but the whole town of Yeovil was declared an AQMA as "*a town wide action plan would be required to manage the local and through traffic*"[45]. This action plan was implemented in 2005 and is still current. It includes measures such as improving roadside infrastructure, improving the standard of the bus service and provision of new cycling facilities along key corridors. Monitored PM_{10}

[45] South Somerset District Council (2010) *Yeovil Air Quality Management Area Progress Report, April 2010.*

concentrations within the AQMA were well below the respective short and long term objectives and therefore the AQMA was only declared for NO_2.

5.7.3 The Yeovil AQMA is located approximately 7 kilometres south of the scheme and is located outside the local ARN (see Figure 5.6, Volume 6.2).

Automatic monitoring

5.7.4 South Somerset District Council does not currently undertake any automatic monitoring. The previous automatic monitoring site at Yeovil District Hospital, which monitored NO_2 and PM_{10}, was removed in 2013 following failure of the equipment and has not been replaced[46].

5.7.5 The nearest automatic monitoring site is the Defra AURN rural background site at Charlton Mackrell, approximately 6 kilometres northwest of the scheme. Due to the close proximity of this site to scheme and that it is located in a similar rural environment, this monitoring site is considered representative of background concentrations at the scheme. Tables 5.7 and 5.8 below present the latest results from the Charlton Mackrell monitoring site. For the past 3 years, annual and hourly NO_2 concentrations at this site have been well below their respective objectives.

Table 5.7: Annual automatic monitoring data for NO_2

Site name	Site classification	National grid reference		Annual mean NO_2 concentration (µg/m3)		
		X	Y	2015	2016	2017
Charlton Mackrell	Rural background	352196	128768	6.0	7.4	5.8

Source: Defra UK AIR 2018[47]
Note: Annual Mean Objective is 40 µg/m^3
All results presented have >99% data capture

Table 5.8: Hourly automatic monitoring data for NO_2

Site name	Site classification	National grid reference		Number of hours NO_2 concentrations were greater than 200 µg/m3		
		X	Y	2015	2016	2017
Charlton Mackrell	Rural background	352196	128768	0	0	0

Source: Defra UK AIR 2018
Note: All results presented have >90% data capture

Diffusion tube monitoring

5.7.6 South Somerset District Council currently undertakes diffusion tube monitoring at 20 sites to assess whether there are any exceedances of the annual mean

[46] South Somerset District Council (2017) *2016 Air Quality Annual Status Report* (ASR).
[47] Defra (2018) UK-AIR: *Air Information Resource* [online] available at: https://uk-air.defra.gov.uk/ (last accessed March 2018).

NO_2 air quality objective. Results at these sites since 2013 are presented in Appendix 5.4, Volume 6.2. These monitoring sites are located approximately 7 to 10 kilometres south of the scheme within the Yeovil AQMA and exceedances of the annual mean NO_2 objective were found at two of these sites in 2017.

5.7.7 A 6-month nitrogen dioxide diffusion tube monitoring survey was undertaken by Mouchel on behalf of Highways England from January 2016 to June 2016. Monitoring was carried out and reported at 15 locations along roads near the scheme as well as a triplicate colocation site at the Charlton Mackrell AURN. The locations of these monitoring sites in relation to the scheme are presented in Figure 5.7, Volume 6.2 and further details of the monitoring survey undertaken can be found in Appendix 5.4, Volume 6.3.

5.7.8 The sites were selected as they were located near to sensitive residential receptors along the section of the A303 that would experience the greatest change as a result of the scheme due to their proximity to the existing carriageway. These sites were also chosen to provide additional monitoring sites for the purpose of the air quality model verification. The results from monitoring were bias adjusted and annualised in accordance with Defra's Local Air Quality Management Technical Guidance (TG16), as described in Appendix 5.4, Volume 6.3.

5.7.9 This monitoring survey concluded that NO_2 concentrations within the vicinity of the scheme are well below the annual mean NO_2 air quality objective. The greatest annual mean NO_2 concentration of 29.7µg/m^3 was recorded at the Hawk House B&B monitoring site, adjacent to the existing A303.

5.7.10 The bias adjusted and annualised results from this monitoring survey are presented in Table 5.9 below.

Table 5.9: Project specific diffusion tube monitoring data for NO_2

Site ID	Location	Site classification	National grid reference		Bias adjusted and annualised NO_2 (µg/m^3) 2016
			X	Y	
001	Chapel Cross Tearoom	Roadside	363096	126330	13.3
002	Brains Lane	Roadside	360781	126516	11.7
003	A359	Roadside	360913	126904	13.3
004	High Street	Roadside	360471	126423	18.7
005	Gason Hill	Roadside	358967	125551	19.7
006	Steart Hill 1	Roadside	357851	125391	19.8
007	Steart Hill 2	Roadside	357435	126624	7.7
008	A303 West of Howell Hill	Roadside	357724	125321	25.6
009	Plowage Lane	Roadside	357074	125029	28.6
010	A303 Hawk House B&B	Roadside	356760	124922	29.7
011	Church Street	Roadside	354621	125071	14.4
012	Higher Farm Lane	Roadside	354653	125228	16.4

Site ID	Location	Site classification	National grid reference		Bias adjusted and annualised NO_2 ($\mu g/m^3$) 2016
			X	Y	
013	Heathcote Road	Roadside	354326	123937	13.7
014	Somerton Road	Roadside	352190	123964	20.8
015	Queen Street	Roadside	349768	120271	13.7
016	Colocation Charlton Mackrell AURN	Rural Background	352196	128768	7.5
017	Colocation Charlton Mackrell AURN	Rural Background	352196	128768	7.0
018	Colocation Charlton Mackrell AURN	Rural Background	352196	128768	7.2

Note: Annualisation factor = 1.08, bias adjustment factor = 0.94. Annual NO_2 AQO = 40µg/m^3

Summary

5.7.11 Scheme specific monitoring data indicates that annual mean NO_2 concentrations are well below the annual NO_2 AQO in the study area. Nearby automatic monitoring at Charlton Mackrell also recorded NO_2 concentrations which were well below the short and long term NO_2 AQOs. While some exceedances were recorded by South Somerset District Council diffusion tube sites in the Yeovil AQMA, these exceedances occurred at sites outside the study area. It is expected that air quality at all receptors within the study area currently meet the relevant NO_2 AQOs.

Defra background concentrations

5.7.12 Defra provides estimates of background pollution concentrations for NO_2, PM_{10} and $PM_{2.5}$ across the UK for each 1 kilometre grid square, for every year from 2015 to 2030. Background pollutant concentrations are spatially and temporally variable throughout the UK, and have been obtained from the Defra website[48].

5.7.13 Table 5.10 presents the maximum background annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations predicted at any grid square across the scheme extent for the base year and opening year scenario. The maximum background NO_2, PM_{10} and $PM_{2.5}$ concentrations are well below annual mean air quality objectives in the base year and opening year scenario.

Table 5.10: Defra maximum background annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ ($\mu g/m^3$) for scheme extent

Grid square location (OS grid reference)		2016			2023		
X	Y	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
360500	126500	7.6	13.6	8.7	5.6	13.2	8.3
356500	124500	7.1	14.7	9.1	5.2	14.2	8.7

[48] Defra (2018) Background maps [online] available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015 (last accessed March 2018).

5.8 Potential impacts

5.8.1 The scheme has the potential to affect both local and regional air quality during the construction and operation phases of the scheme.

Construction

5.8.2 Temporary impacts that have the potential to arise during the construction phase include:

- Temporary on-site dust emissions arising from construction activities and vehicle movements. The word 'dust' usually refers to particulate matter in the size range 1-75 microns in diameter[49]. Dust can be mechanically transported (either by wind or re-suspension by vehicles). It can also arise from wind erosion, for example on material stock piles or from earth moving. This could impact nearby sensitive receptors (residential receptors).
- Road closures and enforcement of speed limits during the construction phase has the potential to result in temporary air quality impacts at human health receptors (residential and schools) and ecological receptors due to changes in the flow, speed and composition of traffic on the road network.

Operation

5.8.3 The operational phase of the scheme has the potential to directly affect local air quality at human health receptors (residential and schools) and ecological receptors and regional air quality as:

- The change in road layout and alignment associated with the scheme has the potential to change the distance between vehicular emissions and receptors; and,
- The scheme has the potential to change the flow, speed and composition of traffic on the road network, and so affect local and regional air quality beyond the physical extent of the scheme.

5.9 Design, mitigation and enhancement measures

Construction

5.9.1 It is expected that construction works would be carried out in accordance with the best practicable means, as described in Section 79 (9) of the *Environmental Protection Act (EPA) 1990*, to reduce fumes or emissions which may impact upon air quality. As a minimum, the following measures are required to prevent

significant effects during the construction phase. These measures are detailed within the **OEMP (*document reference TR010036/APP/6.7*)** and would be implemented by the Contractor through a Construction Environment Management Plan (CEMP):

- Avoid double handling of materials.
- Minimise height of stockpiles and profile to minimise wind-blown dust emissions and risk of pile collapse.
- Locate stockpiles out of the wind (or cover, seed or fence) to minimise the potential for dust generation.
- Ensure that all vehicles with open loads of potential dusty materials are securely sheeted or enclosed.
- Provide a means of removing mud and other debris from wheels and chassis of vehicles leaving the site. This may involve a simple coarse gravel running surface or jet wash, or in the case of a heavily used exit point, wheel washers.
- Maintain a low speed limit on site to prevent the generation of dust by fast moving vehicles.
- Damp down surfaces in dry conditions.
- Water to be sprayed during cutting / grinding operations.
- All vehicle engines and plant motors to be switched off when not in use.
- High dust generating activities within site compounds should be located as far away from nearby receptors as possible.

Operation

5.9.2 The results of the air quality assessment completed for this scheme (presented in section 5.10 of this chapter) demonstrate that the scheme would not have a significant air quality impact. This is because there will be no exceedances of the AQO's, no impacts at Designated sites and the scheme would not affect reported compliance with the *Air Quality Directive*. On the basis of these conclusions no air quality mitigation is required.

5.10 Assessment of likely significant effects

Construction

5.10.1 Mitigation measures would minimise construction dust effects so that they are unlikely to result in significant effects at nearby receptors. Therefore, the assessment of construction phase impacts has focused on the traffic management measures associated with the scheme. Full details of all the construction traffic management measures discussed below can be found in Outline Traffic Management Plan (Annex B.5 of the **OEMP**, ***document reference TR010036/APP/6.7***).

Temporary main carriageway closures

5.10.2 To allow for the installation of traffic management measures (such as contraflows, temporary road markings and installation/removal of the temporary earthworks Bailey bridge), temporary road closures would be implemented from Sparkford to Podimore and Wincanton to Sparkford. The diversion route for the Sparkford to Podimore closure would be via A355 and A37 and the diversion route for the Wincanton to Sparkford road closure would be via the A359 and A371.

5.10.3 There are a small number of residential receptors and one SSSI (Sparkford Wood) within 200 metres of the diversion route for the Wincanton to Sparkford road closure. The diversion route for the Sparkford to Podimore road closure passes through Queen Camel, Marston Magna, Mudford and Yeovil so has a larger number of residential receptors within 200 metres and it passes through the Yeovil AQMA. However, the majority of the temporary road closures and diversions would be enforced overnight (between 21:00hrs to 05:00hrs) for a few nights per year. The longest period anticipated that these diversions would be implemented for is from 22:00hr Friday to 05:00 Monday. This would only occur twice over the 2.5 year construction period to carry out works at Pinch Point A and B (see the construction strategy in section 2.6 of Chapter 2 The Scheme, Volume 6.1). Therefore, this traffic management measure would not have a significant effect on the annual mean NO_2 or PM_{10} concentrations within the Yeovil AQMA or at nearby sensitive receptors due to the limited time it is operational.

5.10.4 Therefore, due to the short term / temporary nature of these road closures, there is unlikely to be a significant air quality effect associated with this traffic management measure.

Temporary and permanent local road closures

5.10.5 Temporary road closures are proposed during the construction phase on a number of local roads[50] (see appendices H.2 to H.10 in the Outline TMP contained in Annex B.5 of the ***OEMP*****, *document reference TR010036/APP/6.7***). Permanent road closures are also planned on Traits Lane and Gason Lane. On all of these local roads traffic flows are less than 2,000 AADT flows so the air quality impact associated with their closure (and subsequent vehicle diversions) would not result in any exceedances. This is because current annual mean NO_2 and PM_{10} concentrations in the study area (as presented in section 5.7 and Appendix 5.4, Volume 6.2) are well below the relevant objectives so the closures on these roads, temporary or permanent, would not result in significant effects.

[50] Steart Hill, Howell Hill, Plowage Lane, Downhead Lane and B3151 Yeovilton Road.

5.10.6 In addition, a permanent road closure is planned on Podimore Road. This road closure has been included within the Do-Something modelling scenario that has been assessed for the operation phase (see paragraphs 5.10.14 to 5.10.36). The assessment of the Do-Something scenario concluded that modelled concentrations across all receptors were well below the annual air quality objectives in the scheme opening year (2023). Considering this, and that annual mean NO_2 and PM_{10} concentrations in this area are well below the objective, during the construction period, the Podimore Road closure would not be expected to lead to exceedances of the annual mean NO_2 or PM_{10} air quality objectives and therefore the air quality effects associated with permanent road closures are considered to be not significant.

Speed limit reductions

5.10.7 The existing speed limit on the single carriageway section of the A303 within the works area is 50 miles per hour. The approach and departure dual carriageway sections at Sparkford and Ilchester are national speed limit (70 miles per hour).

5.10.8 Temporary speed limit reductions from the current speed limit of 50 miles per hour to 40 miles per hour are proposed on the existing A303 between the Podimore Roundabout and Sparkford Roundabout (junction with the A359) for the 2.5 year duration of the construction period (see Appendix H.1 of the Outline TMP) (Annex B.5 of the ***OEMP***, ***document reference TR010036/APP/6.7***).

5.10.9 The current speed limit of 70 miles per hour on the A303 to the east of the Sparkford Roundabout will be reduced to 40 miles per hour until the point where Sparkford Road passes under the A303. Traffic travelling on the westbound approach to the Sparkford Roundabout will have a speed limit of 50 miles per hour for an additional kilometre before the 40 miles per hour speed limit is enforced at Sparkford Road.

5.10.10 Temporary 40 miles per hour speed limits are also proposed on some side roads for example Traits Lane, Vale Lane, Downhead Lane and the B3151.

5.10.11 These speed limit reductions between Podimore and Sparkford Roundabout are likely to result in vehicles travelling at a constant speed of 40 miles per hour with fewer speed variations compared to normal operation. The reduction in speeds would not affect total emissions for this section of carriage way as vehicles travelling at 40 miles per hour and 50 miles per hour are assigned the same emission rate in accordance with IAN 185/15[51].

[51] Highways England (2015) Interim Advice Note 185/15 *Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB*

5.10.12 The reduction in speeds on the A303 to the east of the Sparkford Roundabout would also reduce total emissions as emissions form cars travelling at 40 miles per hour are lower than at 70 miles per hour therefore there would be no significant effects.

Significance of local air quality effects

5.10.13 Overall, the impacts associated with the traffic management measures which would be implemented during the construction phase are not expected to result in significant air quality effects. This is because:

- The temporary road closures and diversions would only occur for very short periods of time and therefore would not affect annual NO_2 or PM_{10} concentrations (particularly within the Yeovil AQMA).
- Permanent road closures occur on local roads with low flows or roads which have been assessed in the operational phase assessment found NO_2 and PM_{10} concentrations at the worst case receptors were well below the short and long term objectives and therefore it is concluded the construction phase would not result in any exceedances.
- Speed limit reductions will result in a constant free flow speed which would likely result in lower vehicle emissions than during normal operation.

Operation local air quality

Overview

5.10.14 Total NO_2 and PM_{10} concentrations were predicted for the base year, opening year Do-Minimum and Do-Something scenarios. The total concentrations of NO_2 predicted in all scenarios and at all worst case receptors are shown below in Table 5.11. The results for PM_{10} at all receptors are presented in Appendix 5.1, Volume 6.2.

5.10.15 The scheme is predicted to cause both increases and decreases in NO_2 and PM_{10} concentrations at modelled receptors due to changes in traffic characteristics on the ARN as well as changes in the distance between receptors and the main A303 carriageway. The changes in traffic flows are primarily due to traffic rerouting from local roads on to the A303 due to the improvements in road capacity and reductions in congestion as a result of the scheme.

5.10.16 Across all modelled receptors annual mean NO_2 concentrations are well below 40µg/m^3 in both the Do-Minimum and Do-Something scenarios. The greatest

Volume 11 Section 3 Part 1 'Air Quality' and Volume 11 Section 3 Part 7 [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf (last accessed July 2018).

Do-Something concentration is predicted at receptor 10 (Hill View, residential), which has a predicted annual NO_2 concentration in 2023 of 28.1µg/m^3.

5.10.17 In accordance with Defra's TG16 guidance, as all predicted annual mean concentrations on NO_2 are well below 60µg/m^3, no exceedances of the 1 hour NO_2 objective are predicted.

5.10.18 For PM_{10}, Do-minimum and Do-something concentrations are also well below 40µg/m^3. The greatest Do-something concentration is predicted at receptor 20 (The Witches, residential), which has a predicted annual PM_{10} concentration in 2023 of 15.0µg/m^3. The greatest increase in PM_{10} at a modelled receptor is 0.2µg/m^3, which is considered imperceptible (resulting in a Do-something concentration at this receptor of 12.7µg/m^3). As modelled PM_{10} concentrations at these worst case receptors are low and increases in PM_{10} are imperceptible, it can be concluded that there will be no significant PM_{10} effects at sensitive receptors a result of the scheme no further discussion is included. The section below will instead focus on NO_2.

5.10.19 Air quality effects at the receptors with the highest NO_2 concentrations and greatest change in NO_2 are discussed in detail in paragraphs 5.10.20 to 5.10.29 below. The locations of the receptors discussed are presented in Figure 5.4, Volume 6.2.

Table 5.11: Local air quality assessment results at human receptors for NO_2 (µg m^{-3}) in Base, Do-Minimum (DM) and Do-Something (DS) scenario

Receptor ID	X	Y	Z	Base Year (2016)		Opening Year (2023)			
				Background	Total	Background	DM Total	DS Total	Impact
1-The Hollies	357084	125028	1.5	8.1	23.5	6.0	20.4	12.2	-8.2
2-Crusty Cottage	357668	125298	1.5	8.1	25.5	6.0	22.7	15.8	-6.9
3-The Firs	357827	125398	1.5	8.1	18.0	6.0	15.4	15.8	0.4
4-Pepperhill Cottage	358964	125601	1.5	8.1	14.6	6.1	12.4	14.8	2.4
5-Spring Lodge	367652	127050	1.5	7.5	27.0	5.7	24.8	26.0	1.2
6-Halfway House	348490	119361	1.5	9.6	28.2	7.1	24.8	25.8	1.0
7-Foss Way	346609	117711	1.5	8.1	16.1	6.0	14.4	14.7	0.3
8-Plowage Lane	357118	125247	1.5	8.1	10.5	6.0	8.6	10.6	2.0
9-Hill View	359776	125218	1.5	8.8	14.7	6.5	12.5	11.9	-0.6
10-Bridge House Park	344674	116536	1.5	8.9	28.9	6.6	27.6	28.1	0.5
11-Townsend	349737	120428	1.5	8.5	17.5	6.3	15.4	16.0	0.6

Receptor ID	X	Y	Z	Base Year (2016)		Opening Year (2023)			
				Background	Total	Background	DM Total	DS Total	Impact
12-Ilchester Community Primary School	352201	123901	1.5	8.8	14.3	6.7	11.9	12.1	0.2
13-Podimore Road	354626	125098	1.5	8.4	11.7	6.3	9.7	10.0	0.3
14-Sparkford Road	360585	126532	1.5	9.3	16.6	6.9	14.1	14.5	0.4
15-Rowan Close	371546	127966	1.5	7.3	19.2	5.7	17.1	17.7	0.6
16-The Beeches	381795	132848	1.5	8.7	18.4	6.6	16.1	16.5	0.4
17-Silton Road	378036	130635	1.5	7.1	16.7	5.4	14.7	15.1	0.4
18-The Witches	359584	124914	1.5	7.2	15.5	5.6	13.6	12.8	-0.8
19-Hazel Grove Lodge	360039	125934	1.5	7.1	13.4	5.5	11.4	11.1	-0.3
20-Wolfester Terrace	359975	125782	1.5	8.8	12.9	6.5	10.7	9.8	-0.9
21-The Beeches Viaduct	381795	132848	0	8.7	19.2	6.6	16.8	17.2	0.4

Scheme extent (Sparkford to Ilchester)

5.10.20 This section of the A303 is located between the Podimore Roundabout and north Sparkford (A303 off-slip to the A359), encompassing the full extent of the scheme including the new junctions at Hazlegrove and Downhead. Along this section of the A303, there are increases in vehicle flows of approximately 3,000 to 4,000 AADT from approximately 29,000 AADT to 33,000 AADT (see Figure 5.3, Volume 6.2 and Appendix 5.1, Volume 6.3 for further details).

5.10.21 The alignment of the main A303 carriageway is different between the Do-Minimum and Do-Something scenario; at some receptors, the A303 carriageway (and therefore the emission source) is much closer with the proposed scheme alignment and at some receptors the proposed scheme alignment is further away from sensitive receptors. This is demonstrated in Figure 5.3, Volume 6.2.

5.10.22 On this section of the A303, the change in annual mean NO_2 concentrations at receptors is primarily due to changes in AADT and the distance of the A303 carriageway from receptors. The scheme does not have a major effect on the Speed Bands assumed in the assessment. It does however bypass the

Sparkford Roundabout where there is heavy congestion in the Do-Minimum on the approaches.

5.10.23 The greatest increase in annual mean NO_2 concentrations in the opening year is predicted at receptor 4 (Pepperhill Cottage) where there is predicted to be an increase in annual mean NO_2 concentrations of 2.4µg/m^3 between the Do-Minimum and Do-Something scenarios. This is because the receptor is located approximately 40 metres north of the new A303 carriageway in the Do-Something scenario, which is 20 metres closer to the main A303 carriageway than in the Do-Minimum. There is also expected to be an increase in traffic flows of approximately 4,000 AADT on the A303 as a result of the scheme.

5.10.24 The greatest improvement in annual NO_2 concentrations in the opening year is predicted at receptor 1 (The Hollies) where there is predicted to be a decrease in annual NO_2 concentrations of 8.2µg/m^3 between the Do-Minimum and Do-Something scenarios. In the Do-Minimum scenario, this receptor is located less than 10 metres away from the edge of the existing A303, while in the Do-Something scenario, the proposed alignment for the proposed A303 is located approximately 80 metres away from the receptor. In the Do-Something scenario, the existing A303 is expected to have traffic flows of less than 1,000 AADT as the majority of traffic on this road will reroute on to the proposed A303. In the Do-Minimum scenario the existing A303 adjacent to this receptor has a flow of 29,000 AADT.

5.10.25 Annual mean NO_2 concentrations at all modelled receptors within the scheme extents are expected to be well below the annual objective in both the Do-Minimum and Do-Something opening year scenarios. A maximum Do-Something concentration of 15.8 µg/m^3 is predicted at receptors 2 and 3 (Crusty Cottage and The Firs), which are located 30 to 40 metres from a section of the proposed A303 alignment with traffic flows of approximately 33,000 AADT in the Do-Something opening year scenario.

Wider study area

5.10.26 This section discusses the air quality impacts for the wider study area (ARN between Ilminster and West Knoyle, beyond the scheme extent). In the wider study area on the A303, there are increases in traffic flows of approximately 1,000 to 2,500 AADT. The wider study area also includes sections of the A359 through Queen Camel, where there are traffic flow reductions of approximately 1,000 AADT. There are very few changes in the speed bands along these sections of road between the Do-Minimum and Do-Something because they are outside the scheme extent and the existing dual carriageway has the capacity for the additional flows. Therefore changes in NO_2 concentrations are associated with changes in AADT and not changes in speeds.

5.10.27 The greatest increase in annual NO_2 concentrations is predicted at receptor 5 (Spring Lodge) where there is predicted to be an increase in annual NO_2 concentrations of 1.2µg/m^3 between the Do-Minimum and Do-Something scenarios. This is because the receptor is located approximately 5 metres north of the A303, where there is expected to be a 2,500 AADT increase in traffic flows as a result of the scheme.

5.10.28 The greatest improvement in annual NO_2 concentrations in the opening year for the wider study area is predicted at receptor 18 (The Witches) where there is predicted to be a decrease in annual NO_2 concentrations of 0.8µg/m^3 between the Do-Minimum and Do-Something scenarios. This receptor is located less than two metres from the edge of the A359, which is expected to experience a decrease in traffic flows of approximately 1,000 AADT in the Do-Something scenario as a result of the scheme.

5.10.29 Annual mean NO_2 concentrations at all modelled receptors in the wider study area are expected to be well below the annual objective in both the Do-Minimum and Do-Something opening year scenarios. As discussed above, a maximum Do-Something concentration of 28.1 µg/m^3 is predicted at receptor 10 (Bridge House Park), which is approximately six metres from the edge of the A303 carriageway and is expected to have a total traffic flow of approximately 47,000 AADT in the Do-Something opening year scenario which is an increase of 1,400 AADT as a result of the scheme.

Designated sites

5.10.30 Table 5.12 shows the modelled NOx concentrations for the closest point of the Whitesheet Hill SSSI to the A303, which is the only sensitive ecological receptor located within 200 metres of the ARN. The location of this receptor is shown in Figure 5.4, Volume 6.2.

5.10.31 In the opening year of the scheme, annual mean NO_x concentrations in this designated site at the closest point to the ARN (and therefore where concentrations will be greatest) is well below the annual mean NO_x objective (30 µg/m^3). This site is expected to experience an increase in NO_x of 0.1 µg/m^3 as a result of the scheme as it is 150 metres away from a road expected to experience an increase in traffic flows of 1,700 AADT as a result of the scheme.

5.10.32 The Do-Something concentrations at the worst case location in the Whitesheet Hill SSSI is well below the NO_x annual objective and there is an imperceptible change in NOx concentrations as a result of the scheme. In accordance with IAN 174/1352 it can be concluded that this site would not be significantly

[52] Highways England (2013) IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07) [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf (last accessed July 2018).

affected by the scheme and no assessment of nitrogen deposition has been undertaken.

Table 5.12: Annual mean NO_2 concentrations at ecological receptors

Receptor ID	NO_X annual mean concentration (µg/m^3)			
	2016 base	2023 DM	2023 DS	Change
E1 Whitesheet Hill SSSI	12.9	9.9	10.0	0.1

Significance of local air quality effects

5.10.33 Table 5.13 presents the number of properties within each magnitude of change category for the scheme.

Table 5.13: Number of Properties Above the Annual Mean NO2 Objective with a Change in Air Quality

Magnitude of change in annual mean (µg/m^3)	Number of receptors with:	
	worsening of an air quality objective already above objective or creation of a new exceedance	improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4)	0	0
Medium (>2 to 4)	0	0
Small (>0.4 to 2)	0	0

5.10.34 As discussed in paragraph 5.10.16, there are no receptors which are expected to experience exceedances of the annual mean NO_2 objective in the Do-Minimum or Do-Something scenario in the opening year of the Scheme; all modelled receptors are expected to experience annual mean NO_2 concentrations which are well below 40µg/m^3.

5.10.35 Table 5.14 presents the overall evaluation of the significance of effect on local air quality. Overall, it is concluded that there are no significant local air quality effects as a result of the scheme.

Table 5.14: Overall evaluation of local air quality significance

Key criteria questions	Yes / No
Is there a risk that environmental standards will be breached?	No
Will there be a large change in environmental conditions?	No
Will the effect continue for a long time?	No
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	No
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
On balance is the overall effect significant?	**No**
Evidence in support of professional judgement: • No adverse large, medium or small changes are predicted at receptors as a result of the scheme • No exceedances of the annual NO_2 or PM_{10} objectives are expected at receptors as a result of the scheme. • There is Low Risk of the scheme causing non-compliance with the EU Directive on ambient air quality as there are no PCM links which overlap with the ARN and no PCM links within 10km of the scheme exceeding 40µg/m^3 for the opening year of 2023.	

Key criteria questions	Yes / No
• Annual NO_x concentrations in designated sites are expected to be well below the annual NO^x air quality objective in the Opening Year Do-Something scenario. Therefore, the overall air quality impacts at nearby designated sites are not considered to be significant.	

Regional air quality

5.10.36 Results of the regional assessment are presented in Table 5.15. The scheme is predicted to cause an increase in regional emissions of NOx, PM_{10} and CO_2 compared to the Do-Minimum scenario in the opening and design year of the scheme. This is due to the improved capacity and reduced congestion at pinch points on this section of the A303 as a result of the scheme. Consequently, as demonstrated in the traffic model, there is expected to be an increase in the number of vehicles using this route, resulting in an overall increase in regional emissions. However, this increase will be minor in the context of national emissions; in 2016 the UK emitted 0.89 million tonnes of NOx and 170 thousand tonnes of PM_{10}[53].

Table 5.15: Regional air quality emissions

Pollutant	2023 DM	2023 DS	2023 change	2038 DM	2038 DS	2038 change
NOx (t/yr)	4062	4074	12.6 (0.3%)	3337	3346	9.6 (0.3%)
PM_{10} (t/yr)	348	350	1.2 (0.4%)	463	465	1.7 (0.4%)
CO_2 (t/yr)	2696464	2703160	6696 (0.2%)	3630501	3639013	8512 (0.2%)

Note: Emission factors are not available beyond 2030. 2030 emission factors have been assumed for 2038. Percentage change based on change from Do minimum.

5.11 Monitoring

5.11.1 No significant adverse effects on human or ecological receptors are anticipated as a result of the scheme, and therefore no additional air quality monitoring for significant effects is required.

5.12 Conclusions

5.12.1 A qualitative assessment of potential dust effects for the scheme has been undertaken, based on a review of likely dust raising activities and identification of sensitive receptors within 200 metres. Potential dust impacts would be suitably controlled using the best practice mitigation measures proposed. A qualitative assessment of the impacts associated with the construction traffic management measures has also been undertaken and concluded that due to the temporary nature of the measures, there are not expected to be significant air quality effects at nearby receptors during the construction phase.

5.12.2 An assessment has been undertaken to assess the air quality impact during the operation of the scheme at receptors, using an atmospheric dispersion model.

[53] Defra (2018) *Emissions of Air Pollutants un the UK, 1970 to 2016*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681445/Emissions_of_air_pollutants_statistical_release_FINALv4.pdf (last accessed June 2018).

The model has been verified against air quality monitoring data and has been used to estimate the air quality impacts of changes in traffic associated with the scheme.

5.12.3 Concentrations across both human health and ecological receptors are expected to be well below the respective PM_{10}, NO_2 and NO_x air quality objectives. The predicted effects from the operation of the scheme on local air quality are therefore concluded to be not significant so no mitigation measures are proposed. There is also a low risk of the scheme causing non-compliance with the *Air Quality Directive* on ambient air quality.

5.12.4 The scheme is predicted to cause an increase in regional emissions of NO_x, PM_{10} and CO_2. However, this increase is minor in the context of national emissions.

5.12.5 Considering the results presented in this assessment the scheme is consistent with national and local planning policy with respect to air quality.

5.12.6 The evidence provided in the ES supports the accordance statement provided in the ***Case for the Scheme (document reference TR010036/APP/7.1*)**.