A303 Amesbury to Berwick Down

TR010025

6.1 Environmental Statement

Chapter 5: Air quality

Volume 6

APFP Regulation 5(2)(a)

Planning Act 2008

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

October 2018

5 Air quality

5.1 Introduction and competent expert evidence

5.1.1 This chapter assesses the potential air quality impacts of the construction and operation of the Scheme, following the methodology set out in Design Manual for Roads and Bridges ("DMRB") Volume 11, Section 3, Part 1 “Air Quality” HA207/07) (Ref 5.1) and associated Interim Advice Notes ("IANs") (Refs 5.2, 5.3, 5.4 and 5.5). This chapter details the methodology followed for the assessment, summarises the regulatory and policy framework related to air quality and describes the existing environment in the area surrounding the Scheme. Following this, the design, mitigation and residual effects of the Scheme are discussed, along with the limitations of the assessment.

5.1.2 This chapter of the ES has been undertaken by competent experts with relevant and appropriate experience. The technical lead for the air quality assessment is David Deakin and his professional qualifications and experience are summarised in Appendix 1.1.

5.2 Legislative and policy framework

5.2.1 As discussed in Chapter 1, the primary basis for deciding whether or not to grant a Development Consent Order (DCO) is the National Policy Statement for National Networks (NPSNN) (Ref 5.6) which, at sections 4 and 5, sets out policies to guide how DCO applications will be decided and how the impacts of national networks infrastructure should be considered. Table 5.1 identifies the NPSNN policies relevant to the air quality assessment and where in the ES chapter information is provided to address the policy.

Table 5.1: Relevant NPSNN policies for applicant’s air quality assessment

Relevant NPSNN paragraph reference	Requirement of the National Policy Statement for National Networks (NPSNN)	Where in the ES chapter is information provided to address this policy.
5.6	Where the impacts of the project (both on and off-scheme) are likely to have significant air quality effects in relation to meeting EIA requirements and / or affect the UKs ability to comply with the Air Quality Directive, the applicant should undertake an assessment of the impacts of the proposed project as part of the environmental statement.	Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1, Construction Phase 2 and Operation considers whether the scheme may cause significant air quality effects. The local air quality compliance risk assessment, also in Section 5.9, considers scheme compliance risks.

Relevant NPSNN paragraph reference	Requirement of the National Policy Statement for National Networks (NPSNN)	Where in the ES chapter is information provided to address this policy.
5.7	The environmental statement should describe: • existing air quality levels; • forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account of the impact of the scheme; and • any significant air quality effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project.	Existing air quality and future baseline air quality is described in Section 5.6 Baseline Conditions and Appendix 5.1. The findings of the assessment are reported in Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1, Construction Phase 2 and Operational phase.
5.8	Defra publishes future national projections of air quality based on evidence of future emissions, traffic and vehicle fleet. Projections are updated as the evidence base changes. Applicant's assessment should be consistent with this but may include more detailed modelling to demonstrate local impacts.	The assessment uses Defra projections (i.e. Emission Factor Toolkit (EFT) with additional speed banding processing) and also Highways England advice on Long Term Trends (LTT_{E6}). Further details are provided in Appendix 5.2 Air quality methodology.
5.9	In addition to information on the likely significant effects of a project in relation to EIA, the Secretary of State must be provided with a judgement on the risk as to whether the project would affect the UK's ability to comply with the Air Quality Directive.	Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1, Construction Phase 2 and Operation considers whether the scheme may cause significant air quality effects. The local air quality compliance risk assessment, also in Section 5.9, considers scheme compliance risks.

Policy

5.2.2 Other relevant policies have been considered as part of the air quality assessment where these have informed the identification of receptors and resources and their sensitivity; the assessment methodology; the potential for significant environmental effects; and required mitigation. These policies include:

a) National Planning Policy Framework (NPPF) published March 2012, section 11, paragraphs 109, 120 and 124 (conserving and enhancing the natural environment) (Ref 5.7). In accordance with the NPPF, the NPSNN policies relating to the applicant's assessment are the primary source of policy guidance regarding this assessment. The NPPF was revised in

2018 (Ref 5.8), with air quality considered in paragraphs 103, 170 and 181, but the requirements which relate to this assessment have not substantively changed, and the NPSNN remains the primary source of policy guidance;

b) Planning Policy and Guidance (PPG) published 2014 (Ref 5.9);

c) Wiltshire Council Core Strategy Development Plan Document adopted January 2015; Policy 55 (Air Quality) and Policy 57 (Ensuring high quality design and place shaping) (Ref 5.10); and

d) UK plan for tackling roadside nitrogen dioxide concentrations published July 2017 (Ref 5.11).

5.2.3 These policies identify the need for a scheme specific air quality assessment to identify any potential air quality impact as a result of the development. The policies also identify measures to mitigate air quality effects through sustainable practices.

5.2.4 The Planning Policy and Guidance (PPG) (Ref 5.9), which is unchanged following the publication of the updated NPPF in 2018, provides a summary of the air quality issues set out in the NPPF. The assessment includes analysis of the following, in accordance with the PPG:

a) The existing air quality in the study area (existing baseline);

b) The future air quality without the development in place (future baseline); and

c) The future air quality with the development in place (with mitigation).

5.2.5 As required the assessment subsequently summarises the predicted changes in air pollution to ascertain whether the Scheme would lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or fail to comply with the requirements of the Conservation of Habitats and Species Regulations (Ref 5.12), in line with the PPG. This means that the assessment is also in accordance with the NPSNN.

5.2.6 By taking account of mitigation measures in order to minimise the impact of the Scheme on air quality, the assessment is in accordance with Wiltshire Council's Core Strategy (Ref 5.10).

Other relevant policy

5.2.7 In July 2017, The Department for Environment, Food and Rural Affairs (Defra) released the 'UK plan for tackling roadside nitrogen dioxide concentrations' (Ref 5.11). The plan principally focuses on empowering local councils to make major changes to their road systems. The plan requires local authorities to set out initial plans by the end of March 2018, followed by final plans by the end of December 2018. Alongside these plans a dataset of Defra's predicted pollutant

concentrations along specific roads was published. This dataset is called the Pollution Climate Mapping (PCM) dataset and this is used to inform the assessment of compliance of the Scheme with EU Limit Values.

5.3 Assessment methodology

General approach

5.3.1 The methodology for the air quality assessment for the Scheme follows the guidance set out within the DMRB (Ref 5.1) and associated IANs (Refs 5.2, 5.3, 5.4 and 5.5). The assessment includes the following elements:

a) Construction phase dust assessment;

b) Construction phase combined assessment of additional construction traffic trips and traffic management;

c) Local operational air quality assessment for public exposure and European and nationally designated habitat sites;

d) Qualitative discussion of tunnel emissions;

e) Compliance risk assessment;

f) Department for Transport (DfT) Web based Transport Analysis Guidance (WebTAG) plan level appraisal; and

g) Regional assessment of pollutant emissions.

5.3.2 Key methodology documents of relevance to the air quality impact assessment are as follows:

a) DMRB, Volume 11, Section 3, Part 1 'Air Quality' (HA207/07) (Ref 5.1);

b) IAN170/12: 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 (Ref 5.2);

c) IAN174/13: Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07) (Ref 5.3);

d) IAN175/13: Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07) (Ref 5.4);

e) IAN185/15: 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 Section 3, Part 7 Noise (Ref 5.5); and

f) Defra Air Quality Management Technical Guidance LAQM.TG(16) (Ref 5.13).

5.3.3 The overall aim of the methodologies listed above is to identify potential likely significant air quality effects and compliance risks with the Ambient Air Quality Directive. A significant air quality effect is defined in IAN 174/13 and this relates to a series of key questions and changes in air quality at locations predicted to be above air quality objectives (Table 5.2) with the scheme.

5.3.4 The key questions for air quality described in IAN 174/13 are as follows:

a) is there a risk that environmental standards will be breached?

b) is there a high probability of the effect occurring?

c) will there be a large change in environmental conditions?

d) will the effect continue for a long time?

e) will many people be affected?

f) is there a risk that protected sites, areas or features will be affected?

g) will it be difficult to avoid, or reduce or repair or compensate for the effect?

5.3.5 Following the collation of information to address the above questions, an informed professional judgement on the significance of local air quality effects for public exposure and nationally designated ecosystems has been established.

5.3.6 The questions set out in paragraph 5.3.4 form the basis for determining likely significant local operational air quality effects for sensitive receptors. The question of how many people would be affected has been addressed by reference to the number of receptors predicted to experience small, medium and large changes in air quality. Where numbers of affected receptors are above the upper thresholds listed in Table 5.2 for locations above the air quality objective, this may suggest significant air quality effects are more likely.

Table 5.2: Guideline for number of properties constituting a significant effect (IAN 174/13)

Magnitude of Change in NO_2 or PM_{10} ($\mu g/m^3$)	No. of Receptors with:	
	Worsening of air quality already above objective or creation of a new exceedance	Improvement of air quality 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

5.3.7 The overall significance of predicted effects on local air quality is also evaluated in the context of relevant national (i.e. NPS NN) and local air quality planning policy and the findings of the compliance risk assessment as described in IAN 175/13.

5.3.8 The approach to significance is consistent with the approach outlined at the scoping stage and discussed with Wiltshire Council.

5.3.9 Detailed methodologies applied within this assessment are described in Appendix 5.2, following the consideration of key environmental receptors and pollutants.

Key environmental receptors

5.3.10 Throughout this assessment, reference is made to sensitive receptors. These are locations where members of the public may be exposed to and affected by air quality impacts. In relation to the Scheme, sensitive receptors are predominantly residential properties, but can also include, for example, schools, and internationally and nationally designated ecosystems. Where sensitive receptors are anticipated to be in a location for only a short period of time, then these locations have been considered against relevant short-term air quality objectives. In this assessment the worst case receptors within the study area have been selected (i.e. receptors closest to affected roads) within 200m, based on guidance presented in HA207/07. In this approach the receptors with the highest predicted concentration and biggest predicted change in pollutant concentration is considered. This is because the effect of pollutants from road traffic reduces with distance from the point of release, and beyond 200m these are likely to have reduced to a concentration equivalent to background concentrations.

Construction phase

5.3.11 The key pollutants considered for the construction phase dust assessment, including any demolition works, are particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) and dust (i.e. larger particles) with the potential to settle around construction sites and cause soiling/deposition effects on surfaces. The sensitive receptors potentially affected are locations of public

exposure for both PM_{10} and dust and European or nationally designated sites for exposure to dust.

5.3.12 Sensitive receptors identified for the construction phase dust assessment are those receptors closest to the Scheme and existing areas which would be affected by construction works (and construction compounds), up to a maximum distance of 200m from the Scheme, based on guidance presented in HA207/07.

5.3.13 Sensitive receptors that may be affected by construction traffic movements (e.g. HGVs) are those located within 200m of routes to and from areas of construction activity along the road network.

5.3.14 Sensitive receptors that may be affected by construction traffic management include those receptors located within 200m of traffic management and potentially wider affected road links.

5.3.15 Construction activities associated with the scheme are expected to occur within approximately 165m of the Stonehenge Monument. Standard and further standard mitigation measures are therefore presented in Appendix 5.4 to manage potential dust and oxides of nitrogen (NO_x) effects associated with a unique assemblage of lichen at Stonehenge.

Operational phase

5.3.16 For nitrogen dioxide (NO_2) and particulate matter (PM_{10}) and ($PM_{2.5}$), there are two sets of ambient air quality criteria for the protection of public health, namely those set by the EU and transposed into UK law by The Air Quality Standards Regulations 2010 (Ref 5.14) and those implementing the UK National Air Quality Strategy (AQS) (Ref 5.15). A new draft Clean Air Strategy 2018 was published on the 22nd of May 2018 (Ref 5.16). The draft Clean Air Strategy 2018 does not amend the air quality objective values considered for the Scheme.

5.3.17 The criteria set out in the AQS include standards and objectives for local authorities to work towards achieving. These apply in locations with relevant public exposure which are defined in the Department for Environment, Food and Rural Affairs' (Defra) technical guidance LAQM.TG(16) (Ref 5.13).

5.3.18 The air quality objectives are outlined in Table 5.3. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect human health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations). Other pollutants also have standards expressed as 24-hour or 1-hour average concentrations due to their acute effects on human health or the natural environment (i.e. after a relatively short period of exposure).

5.3.19 The air quality objectives have been set solely for the purposes of local air quality management. Under the local air quality management regime (Environment Act 1995), local authorities have a duty to carry out regular assessments of air quality against the objectives. If it was unlikely that the objectives would have been met by 2010, local authorities were required to

designate an Air Quality Management Area ("AQMA") and prepare an Air Quality Action Plan ("AQAP") with the aim of achieving the objectives within the timeframes set out in Table 5.3.

5.3.20 The standards set by the EU are legally binding, mandatory limit values (LV) requiring national government compliance at the agglomeration scale. Local air quality criteria relevant to the air quality assessment for the Scheme are summarised in Table 5.3.

Table 5.3: Air quality standards

Pollutant	Averaging period	Limit value / objective	Date for compliance
Nitrogen dioxide (NO_2)	Annual average	40 µg/m^3	UK 11 June 2010
			EU 1 January 2010
	1-hour average	200 µg/m^3 (not to be exceeded more than 18 times a year)	UK 11 June 2010
			EU 1 January 2010
Particulate matter (PM_{10})	Annual average	40 µg/m^3	UK 11 June 2010
			EU 1 January 2005
	24-hour average	50 µg/m^3 (not to be exceeded more than 35 times a year)	UK 11 June 2010
			EU 1 January 2005
Particulate matter ($PM_{2.5}$)	Annual average	25 µg/m^3	2020
			EU 1 January 2015
Nitrogen oxides (NO_x)*	Annual average	30 µg/m^3	UK 31 December 2000
			EU 19 July 2001

** for the protection of ecosystems*

5.3.21 The air quality objective for the protection of vegetation for nitrogen oxides (NO_x) is based on the work of the United Nations Economic Commission for Europe (UNECE) and World Health Organisation (WHO) (Ref 5.17). The objective for the protection of vegetation is an annual mean oxides of nitrogen concentration of 30µg/m^3 and is included in The Air Quality Standards Regulations 2010 (Ref 5.14). The limit value for the protection of vegetation applies in locations more than 12.4 miles (20km) from towns with more than 250,000 inhabitants or more than 3.1 miles (5km) from other built-up areas, industrial installations or motorways.

5.3.22 In addition, critical loads for nitrogen and acid deposition have been determined which represent (according to current knowledge) the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem.

5.3.23 Critical loads are set for different types of ecosystem based on their respective sensitivity to nutrient nitrogen and acidity and have been obtained from the Air Pollution Information System (APIS) website (Ref 5.18) for each designated site with the potential to be affected by the Scheme.

5.3.24 The focus of this assessment is the change in annual mean NO_x and NO_2 concentrations and rates of nitrogen deposition affecting sensitive ecosystems.

Scoping

5.3.25 Table 5.4 sets out the responses given within the Inspectorate's Scoping Opinion. Where assessment has been undertaken in accordance with the Scoping Opinion point, a response and the relevant ES Section is provided; where an alternative approach has been agreed with the relevant stakeholders, an explanation is provided. The Scoping Opinion is provided in Appendix 4.1.

Table 5.4: Scoping Opinion and response

Scoping Opinion	Where addressed within the ES
Planning Inspectorate	
Pollutants considered within the assessment: The Scoping Report states that these pollutants (note: pollutants listed in Applicant's proposed matters to scope out: Carbon monoxide, 1, 3-butadiene, benzene, lead and sulphur dioxide) will not be considered further as national assessments have demonstrated that there is no risk of them exceeding the relevant UK Air Quality Strategy (AQS) objectives due to emissions from traffic anywhere in the UK. Whilst the Applicant has not specifically sought to scope out these matters, the Inspectorate agrees with the Applicant's reasoning and that further consideration of these pollutants can be scoped out of further assessment.	The Applicant acknowledges this agreement. No action required.
Tunnel portals – Dispersion Modelling: The Inspectorate does not consider that sufficient information has been provided to agree to scope this matter out. In particular the Inspectorate is concerned that supporting information is missing such as: • the anticipated concentration of pollutants within the operational tunnel; • details relating to the proposed ventilation strategy and other relevant elements of design; and • evidence to demonstrate there is no potential overlap between emissions released from the portal(s) and emissions along the road network particularly at nearby junctions. On this basis, the Inspectorate does not	As discussed with The Inspectorate at a post-Scoping Opinion meeting on January 30th 2018, the consideration of tunnel portals within the air quality assessment (scoping report paragraphs 6.1.54) relates to how pollutants (i.e. nitrogen dioxide (NO_2) and particulates (PM_{10})) are dispersed in ambient air outside the tunnel. As there are no relevant air quality receptors (i.e. locations where air quality objectives apply) in the immediate vicinity outside the tunnel portals then tunnel portal modelling is not required. To confirm this is the case the closest relevant receptors are located approximately 2km at the western end of the tunnel and 400m at the eastern portal. This approach was discussed with Wiltshire Council on 24th November 2017 and further on 11th

Scoping Opinion	Where addressed within the ES
agree that this matter can be scoped out of the assessment.	September 2018. Information on tunnel portal emissions and the dispersion of these emissions is provided in Section 5.9 Assessment of effects – tunnel emissions discussion.
Study areas: In the Applicant's definition of local and regional study areas, there is reference to the "affected road network" criteria and relevant receptors within 200m thereof. For the avoidance of doubt, the Inspectorate will expect to see an assessment of effects to both human and ecological receptors in the definition of these study areas.	It is confirmed that both human and ecological receptors have been considered within the air quality assessment. The locations of these receptors are listed in Appendix 5.2 Air quality methodology and shown on Figure 5.1 to Figure 5.5.
Baseline: The Scoping Report states that there are no links exceeding 40µg/m^3 NO_2 present within 6.2 miles (10km) of the A303 Stonehenge in the scheme opening year. The ES should explain why a distance of 10km has been used to determine impacts from road contributed concentrations of pollutants with reference to the definition of affected roads.	The affected road network had not yet been defined at the time the Scoping Report was provided an indicative area of 10km was considered within the scoping report. The ES considers all PCM links within the air quality study area in Section 5.9 Assessment of effects, local air quality assessment and local air quality compliance risk assessment.
Baseline and diversionary routes: The definition of baseline conditions should take into account the defined HGV and construction traffic routes, the main and satellite construction compound locations and the high load and diversionary routes.	The agreed routes for the construction phase are considered within the air quality assessment as described in Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1 and Construction Phase 2. The high loads and diversionary routes have not been subject to detailed air quality assessment, as these will be seldom used and as such traffic will not significantly affect air quality along these routes (the routes are described in Chapter 2 (The Scheme) Section 2.3).
Baseline monitoring: No air quality monitoring has been undertaken within the area administered by North Dorset District Council since 2009. The assessment in the ES should be undertaken on the basis of a relevant and up to date data set to establish the baseline conditions and the extent of any likely change within the study area.	The air quality study area is shown on Figure 5.1. The study area identified for the ES does not include the administrative area of North Dorset and so monitoring data for this area has not been included in the air quality assessment. Air quality monitoring data has been used to verify model predictions in the study area. Air quality monitoring data is presented in Section 5.6 Baseline Conditions, Appendix 5.1 Air quality monitoring and Figure 5.2.
Impacts and mitigation: Construction dust and emissions are identified in the Scoping Report as having 'temporary' impacts to human health and that these will be managed by the application of standard mitigation measures. The impacts to human health from	The assessment of effects during the construction phase and identification of appropriate mitigation measures has been undertaken and is reported in Section 5.8 Design, Mitigation and Enhancement Measures and Section 5.9 Assessment of Effects, Construction phase dust assessment. Additionally, see Appendix 5.4

Scoping Opinion	Where addressed within the ES
construction dust (including the duration) should be assessed and reported in the ES. The effectiveness of mitigation measures in reducing the significance of effects should be documented in the ES.	Construction air quality and mitigation.
Impacts from dust on lichen community: Paragraph 6.1.49 of the Scoping Report makes reference to "*unique assemblages*" of lichen at Stonehenge "*that add to the character of the WHS*". On this basis, the ES should fully assess the potential impacts from construction dust on all sensitive receptors, including the lichens found at the Stonehenge monument and the effect to the character of the WHS. The matter should also be addressed as part of the archaeology and cultural heritage assessment.	The assessment of effects during the construction phase and identification of appropriate mitigation measures have been undertaken and reported in Section 5.9 Assessment of Effects, Construction phase dust assessment. Additionally, see Appendix 5.4 Construction air quality and mitigation and Chapter 8 Biodiversity and Appendix 6.1 Heritage Impact Assessment.
Monitoring: It is unclear what the arrangements for ongoing air quality monitoring will be during long term operation of the Proposed Development. The ES should clearly explain the need for, and scope of, long term air quality monitoring proposals and any agreement with stakeholders in this regard.	No significant air quality effects are predicted with the Scheme and therefore no ongoing air quality monitoring is proposed. See Section 5.9 Assessment of Effects, Significance of effects and Section 5.10 Monitoring.
Assessment of $PM_{2.5}$: No reference is made to the need for $PM_{2.5}$ to be considered as specific pollutant within the assessment. The Inspectorate considers that the ES should include an assessment of impacts associated with increased $PM_{2.5}$ resulting from the Proposed Development. In determining significance the assessment should take into account performance against relevant target/limit values.	As discussed with The Inspectorate at a post-Scoping Opinion meeting on January 30th 2018, Highways England methodology does not include specific assessment of $PM_{2.5}$ within air quality assessments of highways schemes. The risk of an exceedance of the $PM_{2.5}$ objective and the risk of likely significant effects has been considered on the basis of predicted PM_{10} concentrations and predicted changes in PM_{10} concentrations. This is because particulate concentrations are expected to be low in the air quality study area and the $PM_{2.5}$ particulate size fraction is part of PM_{10}. $PM_{2.5}$ and PM_{10} concentrations are addressed in Section 5.9 Assessment of Effects, local air quality assessment. This approach was discussed with Wiltshire Council on 24th November 2017 and agreed on 11th September 2018.
Methodology and identification of receptors: Stonehenge as a visitor attraction is not identified in the Scoping Report as a sensitive receptor. The ES should explain how the defined sensitivity of Stonehenge is determined in relation to other identified sensitive receptors (e.g. housing, schools,	The ES includes information on how air quality sensitive receptors are identified and selected in Section 5.3 Assessment Methodology and Section 5.5 Study Area. In relation to the visitor centre at Stonehenge this is not the worst case receptor location along the A360 and so this location has not

Scoping Opinion	Where addressed within the ES
and hospitals).	been explicitly modelled. Receptor R79 is the worst case location along the A360 as it's closest to the road and is located to the north of the visitor centre. This receptor has been modelled explicitly and concentrations of pollutants are well below air quality objectives at this location and therefore this would also be the case at the visitor centre.
Assessment of impacts: Three designated sites (River Avon System SSSI, Stockton Wood and Down SSSI and River Test SSSI) are identified where the critical level for NO_x for the protection of vegetation (30µg/m^3) is likely to be exceeded. The ES should assess the impacts to identified designated sites from the Proposed Development alone and cumulatively with other development. Any specific mitigation measures required to address the effect on these sites from NO_x should be clearly identified and secured.	The air quality assessment includes the identification of changes to NO_x and nitrogen deposition at designated ecologically sensitive sites. Mitigation measures are not anticipated to be required, as significant effects on designated ecosystems are not anticipated, as described in Section 5.9 Assessment of Effects, Designated ecosystems assessment and Significance of effects and also Chapter 8 Biodiversity.
Wiltshire Council	
Future improvements in air quality: It is not thought to be sufficient to assume "the influence of improving vehicle exhaust emissions standards is likely to be greater than any additional growth in traffic in subsequent operational assessment years". Although trends in nitrogen dioxide levels have been downward, there has been an increase in traffic generally. The improvement of the road, whilst welcome, could encourage more traffic to use the route. The potential impact on relevant exposure close to the Countess Roundabout is of concern.	Both trends in air quality and increases in traffic flow over time are included within the assessment of the potential air quality effects of the Scheme, reported in Section 5.9 Assessment of Effects, local air quality assessment and Appendix 5.2 Air quality methodology.
Regional air quality: Whilst the regional assessment of air quality is welcome, specific detail of what this will report is sought.	Additional information on the regional assessment methodology is included in Section 5.3 Assessment Methodology and Section 5.5 Study Area and Appendix 5.2 Air quality methodology.
Nearest AQMA: Paragraph 6.1.7 wrongly identifies Salisbury Centre as the nearest AQMA. The nearest is the Wilton Road (A36T) Salisbury AQMA, which incorporates the lower end of Devizes Road (A360), both of which take HGV traffic to and from Southampton port. Nitrogen dioxide levels on Castle Road (A345) are under close scrutiny. (41ug/m^3, 2016).	All the AQMAs in Salisbury have been considered as part of the assessment.
Wilton Road AQMA: Modelling should examine the impact the project will have on flows on the wider road	The air quality assessment for the scheme considers all roads expected to experience a qualifying change in traffic flows/composition

Scoping Opinion	Where addressed within the ES
network, with particular reference to the Wilton Road AQMA, having regard to the cumulative effects of other development proposed within the Core Strategy and associated policies.	as defined in HA207/07. The do-minimum scenario includes committed developments within the traffic model. The exact schemes and developments included within the traffic model have been developed between the traffic and environment teams, and in discussion with stakeholders. See traffic uncertainty log contained within the Transport Assessment (Application Document 7.4) for the Scheme.
Air quality monitoring: The exact locations of diffusion tube sites within Wiltshire is requested, for example Countess Road, for which the measurements appear very low. Please also confirm the rationale for choosing these locations – are they the nearest receptor to the project?	The locations of diffusion tube monitoring sites are shown in Figure 5.2. Further details of the monitoring are also provided in Appendix 5.1 Air quality monitoring data. The location of diffuse tubes was provided to Wiltshire on 11th July 2018.
Measurement data on Devizes Road: This paragraph which purports to identify key locations where Nitrogen Dioxide annual mean objective is exceeded, makes no mention that the lower portion of Devizes Road is above the 40ug/m^3 limit.	Recently published 2016 data does include this area. This area is not reported in the ES as this is not within the air quality study area (i.e. within the affected road network).
Pollutants considered within the assessment: $PM_{2.5}$ has not been considered.	As discussed with The Inspectorate at a post-Scoping Opinion meeting on January 30th 2018, Highways England methodology does not include specific assessment of $PM_{2.5}$ within air quality assessments of highways schemes. The risk of an exceedance of the $PM_{2.5}$ objective and the risk of likely significant effects has been considered on the basis of predicted PM_{10} concentrations and predicted changes in PM_{10} concentrations. This is because particulate concentrations are expected to be low in the air quality study area and the $PM_{2.5}$ particulate size fraction is part of PM_{10}. $PM_{2.5}$ and PM_{10} concentrations are addressed in Section 5.9 Assessment of Effects, local air quality assessment. This approach was discussed with Wiltshire Council on 24th November 2017 and agreed on 11th September 2018.
Pollutants considered within the assessment: Levels of nitrogen dioxide at Masons Lane, Bradford on Avon, will be considered in the context of the hourly mean objective following the findings of the ASR 2017.	The air quality assessment for the Scheme considers the potential for exceedance of the hourly nitrogen dioxide objective value alongside the annual mean objective. This is reported in Section 5.9 Assessment of Effects. Bradford on Avon is not within the air quality study area for the Scheme therefore adverse effects on nitrogen dioxide concentrations are not anticipated.

Scoping Opinion	Where addressed within the ES
Tunnel spoil and construction traffic routes: Clarification is needed on how it is proposed to dispose of tunnel spoil. If it is to be removed for off-site disposal, details on what will be done to prevent this traffic being routed through AQMAs is required.	The disposal of excavated material is anticipated to be undertaken adjacent to the site. HGV routing during construction, along with traffic management has been considered in the air quality assessment in Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1 and Construction Phase 2.
Significance of effect: As Council officers have not had sight of earlier air quality work, explanation and expansion of the statement that these have suggested no "significant" air quality impacts is required. The impact of the project on air quality will be considered by the Authority in the context of LAQM and the air quality objectives the Authority is obliged to work toward and any impact on achieving these.	The air quality assessment for the scheme considers the potential effect on air quality at sensitive receptors within the study area. The findings of the assessment are reported in Section 5.9 Assessment of Effects, local air quality assessment, Construction phase 1, Construction phase 2 and the operational phase.
Selection of sensitive receptors: The sensitive receptors should be identified, for agreement.	Potentially affected sensitive receptors have been identified based on proximity to the Scheme and the affected road network as defined in HA207/07. Details of sensitive receptors were shared with Wiltshire Council on 11th July 2018.
Assessment of future air quality methodology: We would like to draw your attention to the AQS recent publications and CURED tool, which is more recent than IAN 175/13 http://www.aqconsultants.co.uk/Resources/Download-Reports.aspx	Highways England considers it would not have been appropriate to use the CURED tool developed by a consultant (Air Quality Consultants Ltd) for the purposes of sensitivity tests in air quality assessments. This tool is not Government published advice but is that company's view on a different set of emission factors which effectively uplift the existing EFT version 8 emissions to be used in sensitivity testing against the published guidance. Highways England approach is to use the advice in IAN 170/12v3 which uplifts the modelled concentrations taking account of the trend in actual roadside monitored concentrations and builds in assumptions in relation to future performance of Euro 6/VI vehicles and their potential impact on roadside nitrogen dioxide concentrations in the future.
122. The NPS (para 5.3 and 5.4) recognises the potential for increases in vehicle emissions from both the construction and operational phases of projects on the national networks, and that the effect of national schemes can extend well beyond the DCO boundary. Current UK and EU legislation set out health based ambient air quality objectives which need to be complied with by the Scheme.	The potential increases in vehicle emissions stemming from construction and operational phases are incorporated into the traffic data and emission factors used within our models. The methodology used in the assessment is set out in Section 5.3 Assessment Methodology and Appendix 5.2 Air quality methodology. Air quality objectives and EU legislation has been considered in the assessment, as outlined in Section 5.9 Assessment of Effects, local air quality

Scoping Opinion	Where addressed within the ES
	assessment, Construction Phase 1, Construction Phase 2 and Operational phase and local air quality compliance risk assessment.
123. Potential impacts include: • Impact from both the construction phase particularly during the summer months (soil stripping, spoil disposal, creations of cuttings and bunds). • Long-term traffic related pollution at relevant exposures (residential properties). • Wider potential impacts on existing Air Quality Management Areas (AQMAs) in Salisbury.	The assessment of effects during the construction phase and identification of appropriate mitigation measures has been undertaken and is reported in Section 5.9 Assessment of Effects, Construction phase dust assessment. Additionally, see Appendix 5.4 Construction air quality and mitigation. The air quality assessment has considered the effect of the scheme on long term annual mean NO_2 concentrations, as presented in Section 5.9 Assessment of Effects, local air quality assessment, Construction Phase 1, Construction Phase 2 and Operational phases Wider impacts, including those for AQMAs have also been considered in Section 5.9.
124. There could be adverse effects during the construction phase of the Scheme in relation to construction dust and non-road mobile machinery (NRMM) and vehicle emissions. These could be suitably minimised by the application of industry standard mitigation measures. 125. At this stage in the Scheme details in relation to construction vehicles, the construction schedule, associated activities and detailed plant equipment are not yet available, therefore only a qualitative discussion of potential construction air quality impacts associated with these sources is provided in the PEIR. 126. Air quality from the operational phase of the road scheme has been assessed as having a low impact.	The assessment of effects during the construction phase and identification of appropriate mitigation measures has been undertaken and reported in Section 5.9 Assessment of Effects, Construction phase dust assessment. Additionally, see Appendix 5.4 Construction air quality and mitigation which includes anticipated details of construction vehicles, associated activities and plant equipment which have been developed since the Scoping phase and PEIR. The air quality assessment has considered the operational effects of the scheme, as presented in Section 5.9 Assessment of Effects, local air quality assessment, Operational phase.
127. Construction phase a) No materials shall be burnt on the development site during the construction phase of the scheme. b) A CEMP is to be submitted to and agreed by the Local Authority prior to the commencement of the construction phase to identify measures to mitigate dust generated during the construction of the scheme. c) Traffic diversions should not involve routing traffic through AQMAs. 128. Operational phase d) To examine the legacy impact of the development on Air Quality on A36 and A350 AQMAs and implement mitigation	It is agreed the no materials would be burnt onsite. The Outline Environmental Management Plan (OEMP) (Appendix 2.2) outlines dust generation sources and mitigation based on industry standard practice measures. The measures within the OEMP would be incorporated in a Construction Environmental Management Plan (CEMP). There are a range of diversionary routes associated with the operation of the A303 through Amesbury to Berwick Down, including two strategic diversion routes, two regional diversions and a number of local diversion routes. One of the regional routes does pass through the Salisbury AQMA, but

Scoping Opinion	Where addressed within the ES
measures where a negative impact on Air Quality is predicted at relevant receptors.	this is expected to be used rarely and therefore would not significantly affect air quality. In the construction phase diversionary routes are required to manage incidents, similar to the situation with the current A303 where diversions are required as a result of an incident on the A303. Significant changes in traffic and therefore significant air quality effects are not anticipated during the construction phases through AQMAs. Significant adverse effects from the operational phase of the Scheme are not predicted for the A36 and A350 AQMAs. See Section 5.9 Assessment of Effects, local air quality assessment, Operational phase.
We would expect to see exemplary mitigation during construction to minimise temporary impacts.	The OEMP (Appendix 2.2) outlines dust generation sources and mitigation based on industry standard practice measures.
Para 5.5.10 says: *"the critical level for NO_x for the protection of vegetation (30µg/m^3) is unlikely to be exceeded at all sites, except for the River Avon System SSSI and Stockton Wood and Down SSSI".* Table 5.2 does not appear to show these two sites as being particularly different from the other sites listed. All are significantly below their critical levels for NO_x. It would be helpful to clarify the situation.	It has been clarified that all international and national designated sites are expected to have concentrations of NO_x below critical levels. See Section 5.6 Baseline Conditions.
Public Health England	
When considering a baseline (of existing environmental quality) and in the assessment and future monitoring of impacts these: • Should include consideration of impacts on existing areas of poor air quality e.g. existing or proposed local authority AQMA. • Should include modelling using appropriate meteorological data. • Should include modelling taking into account local topography.	Traffic changes have been reviewed for routes to establish if any AQMAs may be affected by the Scheme against DMRB air quality guidance. There are no AQMAs within the air quality study area for any phase of assessment. Detailed dispersion modelling has been undertaken using ADMS-Roads utilising appropriate meteorological data. Topography has been considered indirectly through the model verification process.
When considering a baseline (of existing environmental quality) and in the assessment and future monitoring of impacts these: • should include appropriate screening assessments and detailed dispersion modelling where this is screened as necessary • should encompass all pollutants which may be emitted by the installation in combination with all pollutants arising	• Detailed dispersion modelling of pollutants has been undertaken for air quality as required. • All relevant pollutants have been considered. • Construction and operational phases have been considered for the Scheme. Any air quality effects associated with decommissioning would be expected to be lower than those

Scoping Opinion	Where addressed within the ES
from associated development and transport, ideally these should be considered in a single holistic assessment. • should consider the construction, operational, and decommissioning phases. • should consider the typical operational emissions and emissions from start-up, shut-down, abnormal operation and accidents when assessing potential impacts and include an assessment of worst-case impacts. • should fully account for fugitive emissions. • should include appropriate estimates of background levels. • should identify cumulative and incremental impacts (i.e. assess cumulative impacts from multiple sources), including those arising from associated development, other existing and proposed development in the local area, and new vehicle movements associated with the proposed development; associated transport emissions should include consideration of non-road impacts (i.e. rail, sea, and air). • should include consideration of local authority, Environment Agency, Defra national network, and any other local site-specific sources of monitoring data. • should compare predicted environmental concentrations to the applicable standard or guideline value for the affected medium (such as UK Air Quality Standards and Objectives and Environmental Assessment Levels): • If no standard or guideline value exists, the predicted exposure to humans should be estimated and compared to an appropriate health-based value (a Tolerable Daily Intake or equivalent). Further guidance is provided in Annex 1. • This should consider all applicable routes of exposure e.g. include consideration of aspects such as the deposition of chemicals emitted to air and their uptake via ingestion. • should identify and consider impacts on residential areas and sensitive receptors (such as schools, nursing homes and healthcare facilities) in the area(s) which may be affected by emissions, this should	assessed for the construction phase. • Typical operational emissions have been considered in detail. Air quality effects are not considered to require detailed consideration for atypical situations (i.e. accidents) as these are expected to occur rarely and not to have a significant short term effect. • Fugitive dust emissions have been considered for the construction phase. • Background pollutants and cumulative effects have been considered as necessary. • Cumulative impacts are considered within the air quality assessment as committed developments are included within the future traffic data scenarios assessed for the scheme, with incremental changes associated with the scheme operation also predicted. • A range of baseline data from previous Highways England monitoring and local authority data has been considered in the assessment. • UK air quality objectives have been considered in the assessment at relevant receptor locations that are present in the existing or future situation. • Nitrogen deposition has been considered for nationally and internationally designated ecosystem sites. • Road traffic and construction pollutants are not subject to assessments of uptake via ingestion, as may be required for an energy from waste process. • Worst case receptor locations have been identified, including residential properties and schools. No additional future committed developments not already considered through the existing worst case receptors have been identified.

Scoping Opinion	Where addressed within the ES
include consideration of any new receptors arising from future development.	
Whilst screening of impacts using qualitative methodologies is common practice (e.g. for impacts arising from fugitive emissions such as dust), where it is possible to undertake a quantitative assessment of impacts then this should be undertaken. PHE's view is that the EIA should appraise and describe the measures that will be used to control both point source and fugitive emissions and demonstrate that standards, guideline values or health-based values will not be exceeded due to emissions from the installation, as described above. This should include consideration of any emitted pollutants for which there are no set emission limits. When assessing the potential impact of a proposed installation on environmental quality, predicted environmental concentrations should be compared to the permitted concentrations in the affected media; this should include both standards for short and long-term exposure.	The assessment of construction dust is typically carried out through qualitative means within air quality assessments for infrastructure developments. Construction dust for the Scheme has been addressed through qualitative assessment consistent with DMRB air quality guidance which has included considered point source and fugitive emissions. A quantitative assessment of construction dust is considered to be disproportionate and would be extremely unlikely to change any of the mitigation measures that have been proposed to manage dust emissions during construction.

Consultation

5.3.26 Discussions were held with Wiltshire Council's Environmental Health team on 24 November 2017 via telephone to outline specific aspects of the air quality assessment. No specific changes to the proposed methodology were required following these discussions. A follow up meeting was held on 2 July 2018 and further calls on the 26 July 2018 and 11 September 2018.

5.3.27 Public consultation comments received and their associated responses are provided within the Consultation Report, a copy of which is included with the DCO application.

5.4 Assessment assumptions and limitations

5.4.1 Monitoring data have been obtained from local authorities and previous scheme-specific studies. The local operational air quality assessment uses a traffic dataset, the latest Defra local air quality management tools and guidance, and Highways England tools and guidance, with the predictions having been checked against the most recently available local air quality monitoring data. This approach minimises the assumptions and limitations of the local operational air quality assessment as far as practicable.

5.4.2 The operational air quality assessment is focussed on the immediate area along and around the Scheme.

5.4.3 The construction air quality assessment is based on the best information currently available. As with all construction air quality assessments the exact details of activities will not be known before a specific contractor is appointed to complete the works and determines their exact construction methods and programme.

5.4.4 It has currently been assumed, in line with project assumptions, that there would be two main phases of construction traffic management (phase 1 and phase 2) and a single year of opening for the scheme rather than a phased opening (Section 2.4). The phase 2 construction scenario includes the partial opening of the Scheme (e.g. the Winterbourne Stoke bypass) whilst the tunnel is being constructed.

5.4.5 The traffic data utilised for the assessment assumes that the Road Investment Programme (RIP) schemes in the Road Investment Strategy (RIS1) to the west of Stonehenge: the A303 Sparkford to Ilchester improvement; and the A358 Taunton to Southfields scheme are constructed and operational. The full details of the schemes included in the traffic data are provided in the uncertainty log for the scheme presented as part of the Transport Assessment (Application Document 7.4).

5.5 Study area

5.5.1 The assessment of construction phase traffic effects (typically HGV assessment and traffic management assessment) and operational phase traffic effects (local operational assessment) use a study area of 200m around road sections likely to be affected by the Scheme. This is due to the effect of pollutants from road traffic reducing with distance from the point of release, and beyond 200m these are likely to have reduced to a concentration equivalent to background concentrations. The DMRB distance of 200m also applies to tunnel portals as described in Section 5.9.

5.5.2 Therefore, individual sensitive receptors (within or outside AQMAs) are studied in the local operational assessment at distances of up to 200m. The air quality study area for the construction phase HGV and traffic management assessments and the local operational assessment consider the Scheme, and those routes where the Scheme is predicted to have an impact (i.e. affected road network (ARN)). Affected road links (individually modelled sections of road) have been identified by comparing traffic data with the Scheme (Do Something) and without the Scheme (Do Minimum) against the local air quality screening criteria presented in DMRB, which are as follows:

a) road alignment will change by 5m or more; or

b) annual average daily traffic (AADT) flows will change by 1,000 or more; or

c) heavy duty vehicles (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or

d) daily average speeds will change by 10km/hr or more; or

e) peak hour speed will change by 20km/hr or more.

5.5.3 These criteria are used to identify whether significant changes in air quality are likely. If a criterion is not met or exceeded, then a significant change in air quality is not anticipated.

5.5.4 The air quality assessment has considered those areas where a change in traffic above the criteria identified above occurs in the immediate area along and around the Scheme as shown on Figure 5.1 for the construction and operation of the scheme. Figure 5.1 shows that none of the Wiltshire AQMAs have affected roads for any of the construction or operational scenarios and so significant air quality effects are not anticipated in any of these AQMAs in any of these scenarios.

5.5.5 Figure 5.1 also shows the Area of Detailed Modelling (AoDM) which has been defined by the transport modelling team to allow traffic scheme effects to be evaluated. The AoDM is the area over which the traffic impacts of interventions are certain and the greatest traffic model detail has been developed. A small number of roads that cross or are close to this AoDM have also been included in the assessment. These nearby links are within a wider area of traffic modelling directly linked to the AoDM, known as the Region of Focus (RoF) and so these nearby roads can be also relied upon to inform the air quality assessment in these areas.

5.5.6 Any potentially affected links beyond these further away from the AoDM and outside the RoF (e.g. east along the A303) are not explicitly modelled as further from the scheme there is less confidence in traffic flows on specific roads and, as such, in any air quality predictions at sensitive receptors along these roads. As the air quality assessment has provided quantitative predictions in the immediate area around the scheme, where the highest changes in traffic are expected, the maximum changes in concentration have been calculated and an evaluation of the significance of these changes has been provided (See Section 5.9 Assessment of effects, Significance of effects).

5.5.7 The exclusion of any quantitative predictions from any wider affected routes would not change any of the conclusions presented in this chapter, as notable changes in air quality in locations with poor air quality (i.e. pollutant concentrations above air quality objectives) are not expected. A qualitative discussion of these potentially affected wider road links away from the AoDM is provided in Appendix 5.2.

5.5.8 Additional links are included in the local operational and construction phase air quality modelling where the additional emissions from these areas or links are required to describe pollutant concentrations at sensitive receptor locations. This has been carried out with regard to sensitive receptors along affected routes and adjacent to the Scheme.

5.5.9 The plan level study area is the same as the local assessment study area as defined in paragraph 5.5.2.

5.5.10 The regional assessment considers emissions rather than concentrations of pollutants. The regional air quality study area is based on the regional screening criteria presented in DMRB given:

a) a change of more than 10% AADT; or

b) a change of more than 10% to the number of HDV AADT; or

c) a change in daily average speed of more than 20km/hr.

5.5.11 The emissions presented for carbon are presented for the whole traffic model study area for consistency with WebTAG (Ref 5.19).

5.6 Baseline conditions

5.6.1 Baseline air quality data and sensitivity receptor data for the study have been gathered from the following sources:

a) Air Quality Management Areas Interactive Map (AQMA) (Ref 5.20);

b) Local Authority monitoring data (Ref 5.21, Ref 5.22 and Ref 5.23);

c) Highways England monitoring data;

d) Defra Pollution Climate Mapping (PCM) Model GIS data for the latest available year (Ref 5.24);

e) Defra air pollution background concentration maps (Ref 5.25);

f) locations of human health receptors (residential properties, schools, hospitals and elderly care homes) from Ordnance Survey (OS) base mapping (Ref 5.26); and

g) boundaries of relevant designated ecological sites (Ref 5.27).

5.6.2 There are no AQMAs within the Scheme extents; the nearest AQMAs are located in Salisbury Centre (Salisbury City Centre AQMA, Salisbury London Road AQMA and Salisbury Wilton Road (A36) AQMA), approximately 6.2 miles (10km) south of Amesbury. There are no AQMAs within the air quality study area in the immediate area along and around the Scheme (Ref 5.20).

5.6.3 Information on areas exceeding EU limit value thresholds is available from Defra's PCM Model (Ref 5.24). This model provides 'road contributed' concentrations of pollutants, including annual mean NO_2. Based on 2017 roadside NO_2 concentrations modelled by the Defra PCM model, no links exceeding 40µg/m^3 are present within the air quality study area.

5.6.4 Estimates of background pollutant concentrations in the UK are available for 1km grid squares throughout the UK up to the year 2030, based on baseline data available for 2015 (Ref 5.25). The projected 2017 background

concentrations for NO_2 and PM_{10} for the grid squares through which the Scheme corridor would physically pass are all below the relevant air quality objectives. Background NO_2 concentrations range from 6.4µg/m^3 to 10.8µg/m^3 whilst background PM_{10} concentrations range from 15.3µg/m^3 to 21.3µg/m^3. Background concentrations for $PM_{2.5}$ are also below the objective value and range from 10.1µg/m^3 to 13.5µg/m^3.

5.6.5 A six month NO_2 diffusion tube survey was undertaken at locations in close proximity to the study area around the A303 between December 2015 and June 2016. The findings of this survey at locations considered within this stage of the assessment are presented in Appendix 5.1.

5.6.6 The results shown in Appendix 5.1 suggest that existing annual mean NO_2 concentrations at kerbside and roadside locations in the air quality study area and adjacent to the A303 are likely to be well below the annual mean AQS objective (40µg/m^3). This survey includes sites within the air quality study area.

5.6.7 Continuous air quality monitoring and passive diffusion tube monitoring is ongoing at specific sites within the areas administered by Wiltshire Council. Air quality monitoring data from these sites was collected between 2010 and 2017.

5.6.8 Passive diffusion tube data collected in the Wiltshire Council area shows there were exceedances of the annual mean AQS objective for NO_2. In 2017 there were eight exceedances recorded out of 77 diffusion tubes. This is not unexpected, as there are eight AQMAs for annual mean NO_2 in the Wiltshire Council area. None of the Wiltshire Council diffusion tube measurement locations exceeding the objective value are within the air quality study area, indicating that the study area is not identified as an area of poor air quality.

5.6.9 Monitored PM_{10} concentrations in Wiltshire are below the relevant UK AQS objectives (Ref 5.22). The maximum measured annual mean PM_{10} concentration was 29µg/m^3 in 2015 and the number of daily mean PM_{10} concentrations greater than 50µg/m^3 was twelve days at the Masons Lane, Bradford on Avon continuous monitoring site. This reduced to an annual mean of 27µg/m^3 and a daily mean PM_{10} concentration exceedance for eight days in 2016.

5.6.10 Considering the relevant pollutants and comparing these against AQS objectives, the following is concluded:

a) national assessments have demonstrated that there is no risk of carbon monoxide, 1,3-butadiene, benzene, lead and sulphur dioxide concentrations exceeding the relevant UK AQS objectives due to emissions from traffic anywhere in the UK. These pollutants have not been considered further as they are very unlikely to be present at levels which would represent potential significant impacts due to the Scheme;

b) for particulate matter (PM_{10}), Wiltshire Council has not identified a risk of exceedances; and

c) for the hourly mean NO_2 UK AQS objective, Wiltshire Council has not identified a risk of exceedance, so the hourly mean for this pollutant is not considered as part of the air quality assessment in terms of having potential for significant impacts due to the Scheme.

5.6.11 On this basis, changes to the annual average NO_2 concentrations represent the focus of the air quality assessment for public exposure (i.e. residential properties) whilst predicted changes to the concentrations of PM_{10} and $PM_{2.5}$ are also reported consistent with the Inspectorate's Scoping Opinion requirements.

5.6.12 Designated ecological sites in the air quality study area SACs, SPAs, SSSIs and Ramsar sites, and which contain features which are sensitive to air pollutants, are summarised in Table 5.5. Site relevant critical loads, maximum nitrogen deposition rates and maximum NO_x concentrations within these designated sites are also presented, which indicate that critical loads for nitrogen deposition are currently exceeded at designated sites in the air quality study area but that the critical level for NO_x for the protection of vegetation ($30\mu g/m^3$) is unlikely to be exceeded at any sites (Ref 5.18).

Table 5.5: Designated ecological sites within air quality study area containing features which are sensitive to air pollutants

Designated site	Relevant nitrogen critical load class	Critical load (kg N/ha/yr)[a]	Max. nitrogen deposition (kg N/ha/yr)[b]	Max. NO_x concentration ($\mu g/m^3$)
Salisbury Plain SSSI / SPA / SAC	Calcareous grassland	15-25	21.8	11.9
	Eurodryas aurinia – Marsh Fritillary	10-15	21.8	11.9
	Circus cyaneus - Hen Harrier	10-20	21.8	11.9
	Falco Subbuteo – Hobby	10-20	34.7	11.9
	Burhinus oedicnemus – Stone Curlew	None Assigned	13.0	11.9
	Coturnix coturnix – Quail	Broad habitat not considered nitrogen sensitive	21.8	11.9
	Bombus humilis – A Carder Bumble Bee	None Assigned	13.0	11.9
	Chirocephalus diaphanous – A Freshwater Fairy Shrimp	None Assigned	13.0	11.9
	Invertebrate assemblage	None Assigned	13.0	11.9

Designated site	Relevant nitrogen critical load class	Critical load (kg N/ha/yr)[a]	Max. nitrogen deposition (kg N/ha/yr)[b]	Max. NO_x concentration ($\mu g/m^3$)
River Avon System SSSI	Fen, marsh and swamp (Phragmites australis swamp and reed-beds)	15-30	21.8	20.8
	Broad-leaved, mixed and yew woodland	10-20	35.6	20.8
	Neutral grassland	20-30	21.8	20.8
	Pisidium tenuilineatum – Pea Mussel	None Assigned	18.2	20.8
	Valvata macrostoma – Large-Mouthed Valve Snail	None Assigned	18.2	20.8
River Avon SAC	Water courses of plain to montane levels with the ranunculion fluitantis and Callitricho-Batrachion vegetation	None assigned	18.2	20.8
	Vertigo moulinsiana – Desmoulin's whorl snail	None assigned	18.2	20.8
	Petromyzon marinus – sea lamprey	None assigned	18.2	20.8
	Lampetra planeri – Brook lamprey	None assigned	18.2	20.8
	Salmo salar – Atlantic salmon	None assigned	18.2	20.8
	Cottus gobio – Bullhead	None assigned	18.2	20.8
River Till SSSI	Fen, marsh and swamp (Phalaris arundinacea tall-herb fen)	Broad habitat not considered nitrogen sensitive	21.8	9.3
	Cottus gobio – Bullhead	None Assigned	12.2	9.3
	Salmo salar – Atlantic Salmon	None Assigned	12.2	9.3
	Vertigo moulinsiana – Desmoulin's Whorl Snail	None Assigned	12.2	9.3
Parsonage Down SSSI	Calcareous grassland	15-25	20.0	9.3
	Vascular plant assemblage	None Assigned	9.9	9.3

Designated site	Relevant nitrogen critical load class	Critical load (kg N/ha/yr)[a]	Max. nitrogen deposition (kg N/ha/yr)[b]	Max. NO_x concentration ($\mu g/m^3$)
Yarnbury Castle SSSI	Calcareous grassland	15-25	19.6	8.4
	Vascular plant assemblage	None Assigned	9.9	8.4
Stockton Wood and Down SSSI	Calcareous grassland	15-25	19.7	8.7
	Hamearis Lucina – Duke of Burgundy	None Assigned	13.7	8.7
	Sehirus dubius – A Plant Bug	None Assigned	13.7	8.7
Steeple Langford Down SSSI	Calcareous Grassland	15-25	20.3	8.9

Relevant nitrogen critical load class, critical load, max. nitrogen deposition rate and max. NO_x concentration data taken from Air Pollution Information System website (http://www.apis.ac.uk/) (Ref 5.18)

Note these values are statistics for the entire designated site. Specific values will be used in the assessment at the modelled locations.

[a] Taken from 'Indicative values within nutrient nitrogen critical load ranges for use in air pollution impact assessments' (http://www.apis.ac.uk/indicative-critical-load-values)

[b] These data are the most recent available from the APIS website and are a 3-year mean for the period 2014-16.

Future baseline

5.6.13 This section provides the future baseline predictions for each year being considered within the air quality assessment, including the two phases of construction assessed (2021 and 2024) and the operational phase (2026).

5.6.14 Predicted concentrations and changes in annual mean NO_2 and PM_{10} along with the predicted number of days exceedance of the 24-hour PM_{10} objective are presented in Appendix 5.3 for all receptors discussed in this section. Receptor locations are illustrated on Figure 5.2.

5.6.15 Annual mean concentrations of NO_2 and PM_{10} are predicted to be below the 40 $\mu g/m^3$ objective value at all 104 modelled sensitive human receptors within the study area, both with and without the Scheme in the opening year of 2026 and both construction phases (2021 and 2024). Therefore, there are also no anticipated exceedances of the hourly NO_2 objective in either scenario. There are no exceedances of the objective for number of days exceedance of the 24-hour PM_{10} objective.

5.6.16 The range of pollutant concentrations predicted for each future baseline year is set out in Table 5.6.

Table 5.6: Predicted range of pollutant concentrations in future baselines

Year	Pollutant	Minimum Concentration ($\mu g/m^3$)	Maximum Concentration ($\mu g/m^3$)
2021	Annual Mean NO_2	6.0	20.7
	Annual Mean PM_{10}	10.6	15.5
2024	Annual Mean NO_2	5.4	16.7
	Annual Mean PM_{10}	10.5	15.3
2026	Annual Mean NO_2	5.1	14.7
	Annual Mean PM_{10}	10.4	15.3

5.7 Potential impacts

5.7.1 Mitigation measures being incorporated in the design and construction of the Scheme are set out in Section 5.8. Prior to implementation of the mitigation, the Scheme has the potential to affect air quality (positively or negatively), both during construction and once in operation, in the following ways:

a) there could be increased emissions of dust during construction of the Scheme from dust-raising activities on site;

b) there could be emissions associated with non-road mobile machinery (NRMM) undertaking construction works;

c) air quality could be affected by changes in traffic flows during construction, as a result of temporary traffic management measures and/or additional vehicles travelling to and from the construction site transporting materials, plant and labour;

d) once operational, by changes in vehicle activity (flows, speeds and composition) as a result of the Scheme; and

e) air quality could be affected by any changes in the distances between sources of emissions and air quality sensitive receptors. The Scheme tunnelled extent would enclose a section of the A303 and would result in emissions from tunnel operations at exit portals.

Construction

5.7.2 There is some potential for adverse effects during the construction of the Scheme in relation to construction dust and plant equipment (e.g. NRMM) and vehicle emissions. However, any impacts on human health related to air quality would be temporary (i.e. during the period of the construction works only) and could be suitably minimised by the application of industry standard mitigation measures. Construction dust emissions generated during tunnelling operations and portal construction, which are likely to be alkaline due to the nature of the material to be excavated, are however considered to have the potential to affect

designated ecological sites and the lichen community found on the Stonehenge monument which may be particularly sensitive to such dust (Ref 5.28). Standard and further standard mitigation measures are therefore presented in Appendix 5.4 to minimise the risk of adverse effects at sensitive receptors.

Operation

5.7.3 On the basis of the available information, including existing monitored concentrations in the wider study area, exceedances of the annual mean NO_2 UK AQS objective have the potential to occur in urban areas within the area administered by Wiltshire Council.

5.7.4 Operational impacts on air quality may be difficult to avoid, but in some circumstances it is possible to reduce or repair impacts on air quality with appropriate mitigation measures, particularly if impacts are focused in a small geographic area rather than spread across the extent of the air quality study area.

5.8 Design, mitigation and enhancement measures

5.8.1 Environmental considerations have been taken into account during the development of the Scheme design. In defining the Scheme design, a range of alternative route options have been subject to multi-disciplinary review (Chapter 3 Assessment of Alternatives).

Construction

Embedded mitigation

5.8.2 The duration of the Scheme's construction programme is approximately five years. During this period there is the potential for changes in air quality due to dust emissions from construction activity, emissions from site plant equipment and HGVs and also from changes in traffic flows along the Scheme and wider road network with traffic management in place.

5.8.3 A CEMP would be prepared and implemented by the construction contractor, which would incorporate measures set out within the OEMP. The CEMP would include a range of best practice construction phase dust mitigation measures required in all works undertaken where there is potential for adverse effects on sensitive receptors (e.g. residential properties, schools and hospitals etc.).

5.8.4 The types of activities with the potential to generate dust during the construction phase include:

a) movement of vehicles;

b) preliminary works (e.g. verge clearance);

c) earthworks;

d) minor demolition (e.g. concrete bases and footings);

e) excavation and installation of drains and communication ducts;

f) construction of retaining walls etc.;

g) surfacing works;

h) central reserve works;

i) installation of verge furniture and planting vegetation; and

j) stock piling/ storage.

5.8.5 The above activities would be mitigated using standard mitigation measures as presented in Appendix 5.4 for example:

a) develop and implement a series of dust management measures and monitoring measures (e.g. periodic visual inspections within and along site boundaries);

b) fully enclose specific operations where there is a high risk of dust production and the site is active for an extensive period;

c) all construction plant would use fuel equivalent to ultra-low sulphur diesel (ULSD) where possible;

d) ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport; and

e) implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site) where reasonably practicable.

5.8.6 Where standard mitigation measures may not be sufficient to minimise emissions of dust alone, further standard mitigation measures are proposed as presented in Appendix 5.4.

5.8.7 The mitigation measures listed in Appendix 5.4 are based on industry best practice and those presented by the Institute of Air Quality Management (IAQM) in their guidance on the assessment of dust from demolition and construction sites (Ref 5.29).

5.8.8 Locations considered to be at higher risk, and therefore requiring the application of further standard measures are those with sensitive receptors (e.g. residential properties, schools and hospitals) close to the works i.e. within 200m.

5.8.9 The further standard measures proposed for air quality during the construction phase are presented in Appendix 5.4 and the OEMP.

5.8.10 As part of good practice for locations with higher dust risks (e.g. Countess Roundabout area) monitoring would be implemented. Monitoring may include

monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections. The OEMP sets out monitoring to be undertaken during the construction stage to ensure that the mitigation measures embedded in the scheme design are appropriately implemented. The final details of any monitoring would be consulted upon between the contractor and Wiltshire Council and these details will be outlined in the final CEMP.

Enhancement mitigation

5.8.11 There are no specific enhancement measures proposed for air quality during the construction phase.

Operation

Embedded mitigation

5.8.12 When traffic speed drops to below approximately 20kph, an appropriate mechanical ventilation system, likely based on a longitudinal jet fan strategy, would be required to manage air quality to acceptable levels within the tunnel. A pollution monitoring system would be included in the tunnel to monitor air quality to inform the use of the ventilation system (refer to the OEMP).

Enhancement mitigation

5.8.13 There are no specific enhancement measures proposed for air quality during the operation of the Scheme.

5.9 Assessment of effects

5.9.1 All relevant human receptors, selected to represent locations where people are likely to be present, are based on potential impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such, the sensitivity of receptors was considered in the definition of the air quality objective values. Therefore, no additional subdivision of human health receptors on the basis of building or location type is necessary because the receptor sensitivity already takes account of a worst case for effects on human receptors.

Construction phase dust assessment

5.9.2 There is potential for temporary adverse impacts from dust emissions to occur at sensitive receptors located close to the Scheme during the construction works.

5.9.3 The following sensitive receptors are located within 200m of the Scheme boundary:

a) the village of Winterbourne Stoke, which includes residential properties and a pub;

b) Northern Amesbury, which includes residential properties, Amesbury Abbey Nursing Home, commercial premises, an office and a hotel;

c) Countess Road, which includes residential properties and a hotel; and

d) farmhouses between Winterbourne Stoke and Amesbury.

5.9.4 The following designated ecological receptors are located within 200m of the Scheme boundary:

a) Yarnbury Castle SSSI;

b) Parsonage Down SSSI;

c) River Till SSSI;

d) River Avon System SSSI /SAC; and

e) Salisbury Plain SSSI /SPA/SAC.

5.9.5 The standing stones at Stonehenge are also around 200m from the Scheme boundary, close to the current A303 alignment, where the unique lichen assemblage described in Section 5.7 Potential impacts (Construction) is located.

5.9.6 The locations listed above could be affected by construction dust emissions. However, the specific activities that are most likely to generate dust and have receptors within 200m of are as follows:

a) stockpiling, construction and minor demolition potentially affecting residential properties along Countess Road, Countess Farm, the nearby Travelodge hotel and the River Avon SSSI/SAC;

b) haul routes potentially affecting Foredown House at Winterbourne Stoke, residential locations in Amesbury and the Travelodge hotel at Amesbury; and

c) earthworks and construction work close to the River Till and Parsonage Down SSSIs.

5.9.7 Site specific mitigation measures may be necessary to avoid significant temporary effects on air quality for these activities and locations, in addition to standard mitigation measures. These measures are outlined in the OEMP and Appendix 5.4. Adoption of such measures would minimise the risk of significant adverse dust effects, such that no likely significant air quality effects would be expected.

5.9.8 Specific further standard mitigation is not considered to be required for the standing stones at Stonehenge as these are located over 1.5km from any potentially notable dusty activities (e.g. tunnelling activities) and these would be

controlled through standard mitigation measures such that no likely significant air quality effects would be expected.

5.9.9 Other emissions associated with the construction phase such as mobile or stationary plant are also not expected to cause a significant air quality effect at receptors. This is because these emissions would be controlled through the mitigation measures provided in Appendix 5.4 and which are included in the OEMP. Further details of the construction plant considered are listed in Appendix 5.4.

Local air quality assessment

Overview

5.9.10 This section provides the predictions for the effect of both traffic management and additional HGVs on sensitive receptors located along affected routes for each of the two phases of construction assessed and the operational phase.

5.9.11 Predicted concentrations and changes in annual mean NO_2 and PM_{10} along with the predicted number of days exceedance of the 24-hour PM_{10} objective are presented in Appendix 5.3 for all receptors discussed in this section. Receptor locations are illustrated on Figure 5.3 (Construction phase 1), Figure 5.4 (Construction phase 2) and Figure 5.5 (Operational phase).

5.9.12 Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted to be below the relevant objective value at all 104 modelled sensitive human receptors within the study area, both with and without the scheme in the opening year of 2026 and both construction phases (2021 and 2024). Therefore, there are also no anticipated exceedances of the hourly NO_2 objective in any scenario. There are no exceedances of the objective for number of days exceedance of the 24-hour PM_{10} objective.

5.9.13 The range of pollutant concentrations predicted in each scenario is set out in Table 5.7 with $PM_{2.5}$ explained in paragraph 5.9.16.

Table 5.7: Predicted range of pollutant concentrations

Year	Scenario	Pollutant	Minimum Concentration ($\mu g/m^3$)	Maximum Concentration ($\mu g/m^3$)
2021	DM	Annual Mean NO_2	6.4	19.8
		Annual Mean PM_{10}	11.1	14.0
	Construction Phase 1	Annual Mean NO_2	6.7	20.7
		Annual Mean PM_{10}	11.0	14.0
2024	DM	Annual Mean NO_2	6.0	18.3
		Annual Mean PM_{10}	11.0	13.9
	Construction Phase 2	Annual Mean NO_2	6.0	18.9
		Annual Mean PM_{10}	10.9	13.9
2026	DM	Annual Mean NO_2	5.8	17.6
		Annual Mean PM_{10}	10.9	13.8
	Operational	Annual Mean NO_2	5.7	18.4
		Annual Mean PM_{10}	10.9	13.9

5.9.14 A majority of the human receptors modelled within the study area (51 of 82 receptors in Construction phase 1, 66 of 76 in Construction phase 2, and 57 of 90 receptors during Scheme operation) are predicted to experience an imperceptible change in annual mean NO_2 and PM_{10} concentrations ($\pm \leq 0.4 \mu g/m^3$). Specific changes in NO_2 and PM_{10} concentrations are, therefore, only discussed below where more than an imperceptible change is predicted.

5.9.15 Predicted changes in PM_{10} concentrations range from -1.6 to +0.5$\mu g/m^3$ in all scenarios and the maximum predicted concentration is 14.0$\mu g/m^3$ which is well below the annual mean objective of 40$\mu g/m^3$, therefore significant effects on air quality are not anticipated.

5.9.16 With a maximum $PM_{2.5}$ background concentration in the opening year of 9.0$\mu g/m^3$ and a maximum PM_{10} contribution from the Scheme of +0.5$\mu g/m^3$ (which $PM_{2.5}$ is a fraction of), total concentrations of $PM_{2.5}$ are also anticipated to be well below the objective value of 25$\mu g/m^3$. This is also the case for the construction phases with small changes that are well below the air quality objective. Significant air quality effects are therefore not predicted for $PM_{2.5}$.

5.9.17 In summary no likely significant air quality effects are predicted for the construction phases or operational phase, as described in the following sections.

Construction phase 1

East of Scheme

5.9.18 There are no locations east of the scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations greater than imperceptible with the Scheme in place.

Along Scheme

5.9.19 At Amesbury, along the A345 between High Street and the A303, sensitive receptors closest to the A345 (R58) are predicted to experience small increases in NO_2 concentration (+0.9µg/m^3) with the Scheme in place, resulting in a concentration of 20.7µg/m^3. This is due to an increase in AADT of approximately 1,000 vehicles along the A345.

5.9.20 Along the A303 west of Countess Roundabout, sensitive receptors closest to the A303 (R102-104) are predicted to experience small decreases in NO_2 concentration (-1.7 to -2.2µg/m^3) with the Scheme in place, resulting in concentrations of 9.2-10.9µg/m^3. This is due to a decrease in AADT of approximately 13,000 vehicles (including approximately 100 HDVs) along the A303.

West of Scheme

5.9.21 There are no locations west of the Scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations that are greater than imperceptible with the Scheme in place.

North of Scheme

5.9.22 In Shrewton and Chitterne sensitive receptors closest to the A360 (R34 and R35) and B390 (R22-R33) are predicted to experience small increases in NO_2 concentration (+0.5 to +1.8µg/m^3) with the Scheme in place, resulting in concentrations of 7.5–17.3µg/m^3. This is due to a predicted increase in AADT of approximately 800-900 vehicles (including approximately 170-190 HDVs) along the A360, and a predicted increase in AADT of approximately 2,300 vehicles (including approximately 220 HDVs) along the B390.

South of Scheme

5.9.23 At Great Wishford, sensitive receptors closest to the A36 (R84) are predicted to experience small increases in NO_2 concentration (+0.5µg/m^3) with the Scheme in place, resulting in concentrations of 13.1µg/m^3. This is due to an increase in AADT of approximately 1,600 vehicles (including approximately 20 HDVs) along the A36.

Construction Phase 2

East of Scheme

5.9.24 There are no locations east of the Scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations greater than imperceptible with the Scheme in place.

Along Scheme

5.9.25 At Amesbury, along the A345 between High Street and the A303, sensitive receptors closest to the A345 (R58) are predicted to experience small increases in NO_2 concentration (+0.6µg/m^3) with the Scheme in place, resulting in concentrations of 18.9µg/m^3. This is due to a small increase in AADT of approximately 500 vehicles (including approximately 10 HDVs) along the A345.

5.9.26 Along the A303 west of Countess Roundabout, sensitive receptors closest to the A303 (R102-103) are predicted to experience small decreases in NO_2 concentration (-0.9 to -1.0µg/m^3) with the Scheme in place, resulting in concentrations of 11.0µg/m^3. This is due to a decrease in AADT of approximately 2,400 vehicles (including approximately 100 HDVs) along the A303.

5.9.27 In Winterbourne Stoke, sensitive receptors closest to the High Street (R48-R51) are predicted to experience large decreases in NO_2 concentration (-6.4 to -9.2µg/m^3) with the Scheme in place, resulting in concentrations between 8.4 to -8.6µg/m^3. They are also predicted to experience small decreases in PM_{10} concentration (-1.1 to -1.6µg/m^3) with the Scheme in place, resulting in concentrations of 11.6µg/m^3. This is due to the diversion of the A303 from the village high street, to approximately 400m north of the village, resulting in a decrease in AADT of approximately 21,900 vehicles (including approximately 2,400 HDVs) along the High Street.

West of Scheme

5.9.28 At Deptford, receptors closest to the A303 (R7) and the A36 (R3) are predicted to experience small decreases in NO_2 concentration (-0.5 to -2.0µg/m^3) with the Scheme in place, resulting in concentrations of 11.2–12.6 µg/m^3. This is due to a decrease in AADT of approximately 10,400 vehicles (including approximately 800 HDVs) along the A303 and an increase in AADT of approximately 600 vehicles (including approximately 30 fewer HDVs) along the A36.

North of Scheme

5.9.29 In Shrewton, sensitive receptors closest to the A360 (R35) are predicted to experience small decreases in NO_2 concentration (-0.5µg/m^3) with the Scheme in place, resulting in concentrations of 14.3µg/m^3. This is due to a decrease in AADT of approximately 700 vehicles.

South of Scheme

5.9.30 There are no locations south of the Scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations greater than imperceptible with the Scheme in place.

Operational phase

East of Scheme

5.9.31 There are no locations east of the Scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations greater than imperceptible with the Scheme in place.

Along Scheme

5.9.32 Along the A303 east of Countess Roundabout, sensitive receptors closest to the A303 (R76) are predicted to experience small increases in NO_2 concentration (+0.6µg/m^3) with the Scheme in place, resulting in concentrations of 11.5µg/m^3. This is due to an increase in AADT of approximately 5,200 vehicles (including approximately 160 HDVs) along the A303.

5.9.33 At Amesbury, along the A345 between High Street and the A303, sensitive receptors closest to the A345 (R58, R60) are predicted to experience small increases in NO_2 concentration (+0.5 to +0.7µg/m^3) with the Scheme in place, resulting in concentrations of 13.9–18.1µg/m^3. This is due to an increase in AADT of approximately 1,400 vehicles (including approximately 70 HDVs) along the A345.

5.9.34 Along the A303 west of Countess Roundabout, sensitive receptors closest to the A303 (R102-104) are predicted to experience medium decreases in NO_2 concentration (-2.6 to -4.0µg/m^3) with the Scheme in place, resulting in concentrations of 7.3–7.6µg/m^3. They are also predicted to experience small decreases in PM_{10} concentration (-0.5 to -0.7µg/m^3) with the Scheme in place, resulting in concentrations of 11.8µg/m^3. This is due to the diversion of the A303 into a tunnel in this location in the DS scenario.

5.9.35 In Winterbourne Stoke, sensitive receptors closest to the High Street (R48-R51) are predicted to experience large decreases in NO_2 concentration (-5.8 to -8.4µg/m^3) with the Scheme in place, resulting in concentrations between 8.7 to8.8µg/m^3. They are also predicted to experience small decreases in PM_{10} concentration (-1.1–1.5µg/m^3) with the Scheme in place, resulting in concentrations of 11.6µg/m^3. This is due to the diversion of the A303 from the village high street, to approximately 400 m north of the village, resulting in a decrease in AADT of approximately 22,400 vehicles (including approximately 2,100 HDVs) along the High Street.

West of Scheme

5.9.36 At Upton Lovell and Codford St Mary, sensitive receptors closest to the A36 (R19-R21 and R14) are predicted to experience small increases in NO_2 concentration (+0.6 to +0.8µg/m^3) with the Scheme in place, resulting in concentrations of 10.8-14.1µg/m^3. This is due to an increase in AADT of approximately 1,900-2,300 vehicles (including approximately 190 HDVs) along these sections of the A36.

5.9.37 At Deptford, receptors closest to the A303 (R7) are predicted to experience small increases in NO_2 concentration (+0.8µg/m^3) with the Scheme in place, resulting in concentrations of 13.4µg/m^3. They are also predicted to experience small increases in PM_{10} concentration (+0.5µg/m^3) with the Scheme in place, resulting in concentrations of 12.8µg/m^3. This is due to an increase in AADT of approximately 5,600 vehicles (including approximately 180 HDVs) along the A303.

5.9.38 At Deptford, receptors closest to the A36 (R2, R3) are predicted to experience small decreases in NO_2 concentration (-1.2 to -1.8µg/m^3) with the Scheme in place, resulting in concentrations of 10.8 – 10.9µg/m^3. This is due to a decrease in AADT of approximately 400 vehicles (including an increase of approximately 10 HDVs) along the A36.

5.9.39 At Chicklade, sensitive receptors closest to the A303 (R98-R100) are predicted to experience small increases in NO_2 concentration (+0.6 to +1.1µg/m^3) with the Scheme in place, resulting in concentrations of 12.2–18.4 µg/m^3. This is due to an increase in AADT of approximately 2,000 vehicles (including approximately 20 HDVs) along the A303.

North of Scheme

5.9.40 At Rollestone Crossroads, sensitive receptors closest to the junction (R47) are predicted to experience small decreases in NO_2 concentration (-0.5µg/m^3) with the Scheme in place, resulting in concentrations of 7.3µg/m^3. This is due to the relocation of the southerly arm of this junction approximately 70m away from its prior position.

5.9.41 In Shrewton, sensitive receptors closest to the A360 (R35-R40) are predicted to experience small decreases in NO_2 concentration (-0.5 to -1.2µg/m^3) with the Scheme in place, resulting in concentrations of 10.3–15.9µg/m^3. This is due to a decrease in AADT of approximately 700 vehicles (including approximately 190 HDVs) along the A360 south of Shrewton, and a decrease in AADT of approximately 1,500-1,600 vehicles (including approximately 170-190 HDVs) along the A360 north of Shrewton.

5.9.42 In Chitterne sensitive receptors closest to the B390 (R23-R24 and R27-R30) are predicted to experience small decreases in NO_2 concentration (-0.5 to -0.8µg/m^3) with the Scheme in place, resulting in concentrations of 6.9–8.1µg/m^3. This is due to a decrease in AADT of approximately 1,500-1,600 vehicles (including approximately 170-190 HDVs) along the B390.

South of Scheme

5.9.43 There are no locations south of the Scheme predicted to experience a change in annual mean NO_2 or PM_{10} concentrations greater than imperceptible with the Scheme in place.

Summary – Road Traffic Air Quality Effects

5.9.44 In summary no likely significant air quality effects are predicted for the construction phases or operational phase. Further details on the evaluation of air quality effects is provided in Significance of effects sub-section.

Tunnel emissions discussion

5.9.45 The emissions of air pollutants from the Scheme tunnel portals are not considered to be potentially significant for air quality sensitive receptors outside the tunnel, such as at residential properties. This section describes why these

emissions are not considered to be potentially significant in ambient air and how emissions inside the tunnel have been considered for road users.

Air Quality – Outside Tunnel

5.9.46 Tunnel portal modelling for ambient air quality outside tunnels is undertaken to capture the specific dispersion characteristics of how pollutants are emitted in the immediate vicinity of portals. These particular characteristics (i.e. spreading of pollution away from the portal) are due to the piston effect of vehicles pushing pollutants out of the outbound tunnel bore.

5.9.47 Tunnel portal modelling is particularly important when ambient air quality outside portals is close to or above relevant air quality objectives where air quality may be poor and where there are nearby sensitive receptors.

5.9.48 As there are no relevant air quality receptors (i.e. locations where air quality objectives apply) in the immediate vicinity outside the tunnel portals then tunnel portal modelling is not required. The closest relevant receptors are located approximately 2km from the western end of the tunnel and 400m from the eastern portal. The approximate distances of the closest residential and designated ecosystems are as follows:

a) Western Portal:

   i. Springbottom Farm, located 2km from the portal;

   ii. River Till SSSI and SAC, located 2.7km from the portal; and

   iii. River Avon SSSI and SAC, located 2.8km from the portal.

b) Eastern Portal:

   i. Properties on Stonehenge Road, located 400m from the portal;

   ii. Stonehenge Cottages, located 650m from the portal; and

   iii. River Avon SSSI and SAC, located 750m from the portal.

5.9.49 To put these distances into context, relevant receptors are not considered at distances of more than 200m from roads as concentrations trend towards background concentrations without notable contributions from roads (e.g.DMRB air quality guidance). The DMRB distance of 200m also applies to tunnel portals with research findings identifying that the impact of portal emissions typically only extends up to about 100 to 200m (e.g. Ref 5.30).

5.9.50 Even if receptors were closer to the tunnel portals, as described above this type of additional portal modelling is only important in areas of potentially poor air quality. The locations of the tunnel portals are not located in areas of poor air quality. The closest air quality monitoring indicates that air quality is good with

concentrations of less than 20 µg/m^3 measured by Highways England for 2015 along the A303.

5.9.51 It should also be noted that at the eastern portal the closest relevant receptors, Stonehenge Cottages, are expected to experience an improvement in air quality due to the tunnel, as the tunnel would remove the vehicle emissions from the A303 that are currently only approximately 23m from the closest properties.

Air Quality – inside tunnel

5.9.52 The tunnel is being designed in line with regulatory requirements for the operation of a highway tunnel, along with European Directives that either supersede or are in supplement to the UK regulations. These regulations require that air quality is controlled appropriately for users of the tunnel (i.e. road users and workers) and therefore only a design which achieves these regulations would be constructed.

5.9.53 Air quality within the tunnel, under the current preliminary design, would be controlled by the use of a mechanical ventilation system. When the levels of pollutants are shown to be above specified threshold limits the ventilation fans would be operated to bring a greater volume of fresh air into the tunnel.

5.9.54 It is anticipated, based on predictions of in-tunnel air quality undertaken as part of the tunnel design, that air quality would be unacceptable in the tunnel without the mechanical ventilation system under some circumstances (refer to paragraph 5.8.12). The tunnel would generally self-ventilate through the piston effect from traffic.

Designated ecosystems assessment

5.9.55 This section sets out the predicted effects of the Scheme for the two construction phases and the operational phase on designated ecosystems within 200m of an affected road.

5.9.56 The results are presented in summary for the point in each ecosystem which experiences the greatest change in each scenario in Table 5.8 and in full in Appendix 5.3. The results presented are for the oxides of nitrogen (NO_x) and nitrogen deposition (known as N dep, as kilograms of nitrogen per hectare per year (kg N ha^{-1} yr^{-1}).

Table 5.8: Designated ecosystem results summary

Ecological Site	Scenario	Closest point to road					Distance from road where NO_x conc. <30 µg/m^3 (m)
		Distance (m)	Max DS NO_x Conc. (µg/m^3)	Max NO_x Change (µg/m^3)	Max DS Ndep (kg N ha^{-1} yr^{-1})	Max N dep Change (kg N ha^{-1} yr^{-1})	
Salisbury Plain (E1)	Construction Phase 1	3	15.2	+3.2	15.5	+0.2	3
	Construction Phase 2	3	10.1	-0.8	14.4	<0.1	3

Ecological Site	Scenario	Closest point to road					Distance from road where NO_x conc. <30 µg/m^3 (m)
		Distance (m)	Max DS NO_X Conc. (µg/m^3)	Max NO_X Change (µg/m^3)	Max DS Ndep (kg N ha^{-1} yr^{-1})	Max N dep Change (kg N ha^{-1} yr^{-1})	
	Operation	3	7.9	-0.7	13.8	-0.1	3
Salisbury Plain (E2)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	-	-	-	-	-	-
	Operation	0	10.7	-2.3	14.1	-0.2	0
Salisbury Plain (E3)	Construction Phase 1	6	42.1	-2.2	16.8	-0.1	16
	Construction Phase 2	6	31.7	-8.4	15.5	-0.4	11
	Operation	6	25.2	+1.3	15.5	+0.1	6
Yarnbury Castle (E4)	Construction Phase 1	79	9.7	-0.6	17.5	<0.1	79
	Construction Phase 2	79	8.5	-0.8	16.5	<0.1	79
	Operation	79	7.2	+0.2	15.9	<0.1	79
River Avon System (E5)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	-	-	-	-	-	-
	Operation	2	18.7	+0.8	15.3	+0.1	2
River Avon System (E6)	Construction Phase 1	5	32.6	+0.7	16.8	<0.1	10
	Construction Phase 2	5	23.5	-5.3	15.5	-0.3	5
	Operation	5	18.7	+0.5	15.2	+0.1	5
River Avon System (E7)	Construction Phase 1	1	13.2	-0.9	15.8	-0.1	1
	Construction Phase 2	1	11.3	-1.4	14.9	-0.1	1
	Operation	1	9.3	+0.3	14.4	<0.1	1
Stockton Wood and Down (E8)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	-	-	-	-	-	-
	Operation	5	19.1	+0.6	17.2	+0.1	5
River Till (E9)	Construction Phase 1	2	36.6	-6.9	19.5	-0.4	7
	Construction Phase 2	2	9.7	-29.6	18.7	-1.7	2
	Operation	2	9.9	-13.5	16.6	-1.3	2
River Till (E10)	Construction Phase 1	6	23.8	+2.8	18.8	+0.2	6

Ecological Site	Scenario	Closest point to road					Distance from road where NO_x conc. <30 µg/m^3 (m)
		Distance (m)	Max DS NO_x Conc. (µg/m^3)	Max NO_x Change (µg/m^3)	Max DS Ndep (kg N ha^{-1} yr^{-1})	Max N dep Change (kg N ha^{-1} yr^{-1})	
	Construction Phase 2	6	16.3	-2.6	17.4	-0.2	6
	Operation	6	12.1	-0.6	16.8	-0.1	6
Salisbury Plain (E11)	Construction Phase 1	4	15.0	-2.8	15.5	-0.2	4
	Construction Phase 2	4	11.8	-4.4	14.5	-0.3	4
	Operation	4	9.2	-1.7	14.0	-0.2	4
Parsonage Down (E12)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	59#	9.1	+1.4	16.7	+0.1	59
	Operation	59#	7.4	+1.3	16.1	+0.1	59
Parsonage Down (E13)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	164#	7.7	-0.2	16.6	<0.1	164
	Operation	164#	6.5	+0.2	16.0	<0.1	164
River Till (E14)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	0#	27.4	+20.5	18.0	+1.2	0
	Operation	0#	29.3	+22.7	17.5	+1.3	0
River Till (E15)	Construction Phase 1	-	-	-	-	-	-
	Construction Phase 2	0#	22.9	+15.9	17.8	+0.9	0
	Operation	0#	24.6	+18.0	17.3	+1.1	0
Steeple Langford Down (E16)	Construction Phase 1	27	14.3	+0.3	18.4	<0.1	27
	Construction Phase 2	-	-	-	-	-	-
	Operation	-	-	-	-	-	-

- where a site is not within 200m of an affected road in that scenario

 # distance from A303 in DS scenario

5.9.57 Large increases in annual mean NO_x concentrations are predicted at the River Till (E14 and E15) in construction phase 2 and during the operational phase due to the opening of the realigned A303 in these scenarios. Similarly there are large decreases at the River Till (E9) in the same scenarios as traffic routes onto the new A303 and away from the current A303 alignment.

5.9.58 The significance of the predicted changes in NO_x and nitrogen deposition for these designated habitats is considered in Chapter 8 Biodiversity. In summary no likely significant air quality effects are anticipated from the changes in air quality predicted.

Local air quality compliance risk assessment

5.9.59 The results of the local air quality construction (Phase 1 and Phase 2) and operational assessment have been used to determine compliance risks with the EU Air Quality Directive (Ref 5.31), following guidance set out within IAN 175/13 (Ref 5.4).

5.9.60 A comparison between the outcome of the local construction and operational assessment and those links reported by Defra to the European Commission as non-compliant has been undertaken. This comparison has found that there are no links anticipated to be non-compliant with the limit values within the air quality study area for the Scheme in the construction phases (2021 and 2024) and the proposed opening year of 2026.

5.9.61 This indicates that there is no risk of non-compliance with the EU Air Quality Directive for the Scheme and thus an AQAP should not be required for either the construction or operation of the scheme.

Operational impacts – local air quality plan level WebTAG appraisal

5.9.62 A plan level WebTAG appraisal has been completed in respect of PM_{10} and NO_2 exposure. This assessment has been developed using the WebTAG methodology (Ref 5.19) which considers individual links in isolation. The results of this assessment are provided as required by DMRB guidance (Ref 5.1), in Table 5.9 and Table 5.10.

5.9.63 The results of the plan level WebTAG appraisal show that for PM_{10} there is a net benefit with a negative score. A total of 671 properties are predicted to experience an improvement in concentrations, whilst no properties are predicted to experience no change and 615 a deterioration.

Table 5.9: Plan level results for PM_{10}

Aggregated Table	0-50m	50-100m	100-150m	150-200m	0-200m
Total properties across all routes (Do Minimum)	368	284	326	332	1,310
Total properties across all routes (Do Something)	364	279	316	327	1,286
Do Minimum PM_{10} assessment across all routes	4,510	3,366	3,835	3,883	15,594
Do Something PM_{10} assessment across all routes	4,425	3,305	3,727	3,823	15,280

Aggregated Table	0-50m	50-100m	100-150m	150-200m	0-200m
Net total assessment for PM_{10}, all routes (II-I)	-314				
Number of properties with an improvement	671				
Number of properties with no change	0				
Number of properties with a deterioration	615				

5.9.64 The results of the plan level WebTAG appraisal show that for NO_2 there is a net benefit with a negative score. A total of 711 properties are predicted to experience an improvement in concentrations, whilst no properties are predicted to experience no change and 575 a deterioration.

Table 5.10: Plan level results for NO_2

Aggregated Table	0-50m	50-100m	100-150m	150-200m	0-200m
Total properties across all routes (Do Minimum)	368	284	326	332	1,310
Total properties across all routes (Do Something)	364	279	316	327	1,286
Do Minimum NO_2 assessment across all routes	3,320	1,922	2,013	1,964	9,219
Do Something NO_2 assessment across all routes	3,004	1,864	1,956	1,932	8,755
Net total assessment for NO_2, all routes (II-I)	-464				
Number of properties with an improvement	711				
Number of properties with no change	0				
Number of properties with a deterioration	575				

Operational impacts – regional assessment

5.9.65 This section outlines the results of the regional air quality assessment for the Scheme opening year (2026) and design year (2041) for CO_2, NO_x and PM_{10}.

5.9.66 The results indicate that reduced emissions of NO_x and CO_2 are anticipated between the present or baseline situation and the opening year without the Scheme (see Table 5.11). These reductions are due to projected improvements in vehicle emissions over time, a small increase is predicted in PM_{10}, as the

increase in traffic expected over time is not outweighed by expected improvements in PM_{10} emissions. This is because PM_{10} emissions are already much lower than oxides of nitrogen emissions per vehicle.

5.9.67 Increases in emissions are anticipated in the opening year with the Scheme (Do Something) compared to the without Scheme (Do Minimum) situation. This is primarily because of the increased traffic flows predicted with the operation of the Scheme and increases in vehicle kilometres travelled.

5.9.68 In comparison to national CO_2 emissions targets, increases in CO_2 from the whole of the strategic road building scheme, as noted in the NPSNN, anticipated over the next 10-15 years are considered to be small and the increases associated with the Scheme are part of that small increase.

Table 5.11: Opening year regional assessment results

Pollutant	Present (2017) (tonnes)	Without Scheme opening year (tonnes)	With Scheme opening year (tonnes)	With Scheme compared with	
				Present without Scheme (tonnes)	Future without Scheme (tonnes)
CO_2	61,917,014	59,124,590	59,148,580	-2,764,434	+23,990
NO_x	193.9	99.9	118.5	-75.4	+18.6
PM_{10}	13.8	14.0	15.3	+1.5	+1.3

5.9.69 In the design year (2041), increases in pollutant emissions are predicted between the baseline and future situation (see Table 5.12) for PM_{10} and CO_2, with reduced emissions of NO_2. Between the future without scheme (Do Minimum) and with scheme (Do Something) scenarios, an increase in all emissions is predicted as a result of the increased traffic flows predicted with the Scheme.

Table 5.12: Design year regional assessment results

Pollutant	Present (2017) (tonnes)	Without Scheme design year (tonnes)	With Scheme design year (tonnes)	With Scheme compared with	
				Present without Scheme (tonnes)	Future without Scheme (tonnes)
CO_2	61,917,014	66,939,225	66,973,140	+5,056,126	+33,915
NO_x	193.9	91.1	109.8	-84.1	+18.7
PM_{10}	13.8	16.5	18.5	+4.7	+2.0

Significance of effects

5.9.70 The significance of the operational air quality effects as a result of the Scheme has been evaluated and results presented in Table 5.14. This focuses on key locations where annual average NO_2 is predicted to be greater than the air quality objectives. Table 5.13 presents supporting information concerning the key question of how many people would be affected.

Table 5.13: Numbers of properties affected, local operational assessment

Magnitude of change in annual average NO_2 ($\mu g/m^3$)	Total Number of receptors with:	
	Worsening of air quality already above objective or creation of a new exceedance	Improvement of an air quality already above objective or the removal of an existing exceedance
Large (>4)	0 (1 to 10)	0 (1 to 10)
Medium (>2 to 4)	0 (10 to 30)	0 (10 to 30)
Small (>0.4 to 2)	0 (30 to 60)	0 (30 to 60)

Numbers in brackets set out threshold for significant effect as per Table 2.3 in Highways Agency (2013a). No locations are affected by potentially significant changes in PM_{10} or $PM_{2.5}$.

Table 5.14: Evaluation of local operational air quality significance

Key criteria questions	Yes/No	Supporting information
Is there a risk that environmental standards will be breached?	No	Annual average concentrations of NO_2 are not predicted to be exceeded during the construction or operation of the scheme.
Will there be a large change in environmental conditions?	No	No large adverse changes are predicted, above an air quality objective.
Will the effect continue for a long time?	No	As no large adverse changes are predicted, above an air quality objective, the effect is not considered to last a long time.
Will many people be affected?	No	No properties are predicted to be affected by small, medium or large changes in air quality above an air quality objective for the protection of human health.
Is there a risk that designated sites, areas or features will be affected?	No	See Chapter 8 Biodiversity.
Will it be difficult to avoid or reduce or repair or compensated for the effect?	No	No predicted significant effects to mitigate.
On balance is the overall effect significant	No	See below.
Evidence in support of the judgement There are no predicted annual average concentrations of NO_2 above the air quality objective in either the years of construction or first year of operation for the scheme in the air quality study area. Therefore there are no small, medium or large changes in air quality above the air quality objective. A compliance risk assessment has been undertaken for the air quality study area. This found that there are no links reported by Defra to the European Commission as non-compliant in either the years of construction or the first year of scheme operation within the air quality study area. This indicates there is no compliance risk for the scheme. The air quality effects of the Scheme for European and National designated ecosystem sites is considered in Chapter 8 Biodiversity. The ecology assessment has concluded that the predicted changes in air quality and nitrogen deposition are not significant. Temporary construction effects, associated with dust and plant equipment are also not		

Key criteria questions	Yes/No	Supporting information
considered to be significant with the implementation of mitigation measures as outlined in the OEMP. Overall, as there are no properties with adverse changes in air quality (small, medium or large) above the objective and there is no adverse effect on air quality for compliance links or European and nationally designated habitat sites, an overall evaluation of 'not significant' has been assigned to the Scheme for traffic emissions in either the construction or operational phases for air quality effects.		

5.9.71 The air quality assessment has presented the information required within the NPSNN and NPPF. The results of the assessment suggest that the air quality effects of the Scheme are consistent with relevant national, regional and local planning policy, with no significant air quality effects predicted or compliance risks identified.

5.9.72 In summary, no significant effects are anticipated during construction or operation of the Scheme. Non-significant effects are summarised in Appendix 5.5.

5.10 Monitoring

Construction

5.10.1 As no significant effects have been identified for the air quality construction assessment, no monitoring of significant effects is proposed.

Operation

5.10.2 As no significant effects have been identified for the air quality operation assessment, no monitoring of significant effects is proposed.

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