

A303 Stonehenge – Amesbury to Berwick Down

EIA Scoping Report

P03, S4

20 October 2017

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Document Control

Document Title	Environmental Scoping Report
Document Reference	HE551506-AMW-EAC-SW_GN_000_Z-RP-LE-0001
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Document Status	S4

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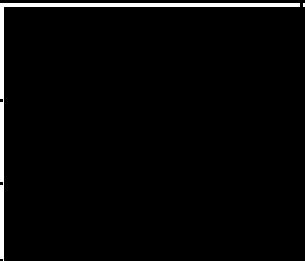
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Revision History

Version	Date	Status	Description	Author
P01	29 th September	S3	For internal comment	William Barrett
P02	16 th October	S3	For Final Review	William Barrett

AmW Approvals

Version	Role	Name	Signature	Date
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Highways England Approval


Version	Title	Name	Signature	Date
P03	Project Director	Derek Parody		20 th October 2017

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1 Introduction

1.1 Overview and need for the proposed Scheme

- 1.1.1 The A303/A30/A358 corridor is a vital connection between the South West and London and the South East. While most of the road has been dualled, there are still over 35 miles (56 km) of single carriageway. These sections act as bottlenecks for users of the route resulting in congestion, particularly in the summer months and at weekends. This causes delays to traffic travelling between the M3 and the South West and increases the risk of accidents.
- 1.1.2 The A303 passes through the Stonehenge, Avebury and Associated Sites World Heritage Site (the WHS), passing approximately 165m from the Stonehenge monument itself. It is noted that the WHS comprises two distinct components – Avebury to the north and Stonehenge to the south. The Scheme crosses the Stonehenge component only and as such all subsequent references to “the WHS” in this report refer to the Stonehenge component.
- 1.1.3 The A303 Stonehenge – Amesbury to Berwick Down Scheme (the proposed Scheme) is part of a wider package of proposals for the A303/A358 corridor designed to transform connectivity to and from the South West by creating a dual-carriageway. The A303/A358 package was identified in the 2014 National Infrastructure Plan as one of the country’s top 40 priority infrastructure projects.
- 1.1.4 The proposed Scheme will address the following problems and opportunities:
- a) Local and regional economy – The A303 is a strategic route to the South West. Enhancing this corridor will deliver region-wide economic benefits by improving regional connectivity, facilitating planned growth in housing and jobs, and by improving the perceptions of tourists who use the A303 to travel to the region.
 - b) Strategic traffic issues – This section of the A303 operates at almost twice its capacity with an Annual Average Daily Traffic (AADT) of 24,000 vehicles. The congestion experienced at weekends and during the summer months results in lengthy delays for users, with increased journey times westbound past Stonehenge of up to an hour.
 - c) The WHS – At its closest point the existing A303 passes within 165 metres of the Stonehenge monument and creates highly intrusive sights and sounds of traffic, detracting from an otherwise tranquil rural setting for the Stones. The existing A303 runs through the heart of the WHS dividing it in two. This severance impacts on people’s experience and understanding of the WHS, by limiting the safe mobility of visitors and opportunities to explore the area south of the A303.
 - d) Local traffic issues – Local communities are directly affected by both traffic on the A303, and that which is seeking to avoid congestion and delays on the main route by using the local network. This has a severe impact at busy times. For example, on a typical Friday in August, traffic volumes on the B3086 through Shrewton are around 60% higher than on a normal weekday.

- e) Safety –The rate of personal injury accidents on this section of the A303 is higher than the national average for A roads.
- f) Environment and community – The A303 passes through a rural area of gentle rolling chalk downland with expansive views. The A303 passes through the village of Winterbourne Stoke, much of which is a Conservation Area to the south of the road. Existing road safety and traffic calming infrastructure have a damaging effect on the character and setting of the village. High traffic noise levels impact on the quality of everyday life for residents.
- g) Local communities and the WHS – The A303 creates a physical barrier between the WHS and the local community of Amesbury. The proposed Scheme presents an opportunity to reconnect Amesbury with the WHS.

1.2 Legislative context and need for environmental impact assessment

- 1.2.1 The proposed Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(h) and Section 22 of the Planning Act 2008 (PA 2008) (as amended by The Highway and Railway (Nationally Significant Infrastructure Project) Order 2013) (Ref 1) by virtue of the fact that:
 - a) it comprises the construction of a highway;
 - b) the highway to be constructed is wholly in England;
 - c) the Secretary of State is the highway authority for the highway; and
 - d) the speed limit for any class of vehicle on the highway is to be 50 miles per hour or greater, and the area for the construction of the highway is greater than 12.5 hectares.
- 1.2.2 In accordance with the legislation, a Development Consent Order (DCO) is therefore required to allow the construction and operation of the proposed Scheme.
- 1.2.3 The proposed Scheme will be subject to an Environmental Impact Assessment (EIA), as reported within an Environmental Statement (ES), on the basis that it is considered to be EIA development and specifically Schedule 1 development satisfying Clause 7 (3) of Schedule 1 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (Ref 2). The proposed Scheme is “Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road, would be 10 kilometres or more in a continuous length”.
- 1.2.4 In accordance with Regulation 8(1)(b) of the EIA Regulations, Highways England has notified the Secretary of State for Transport (Secretary of State) in a letter to the Planning Inspectorate dated 20th October 2017 that an ES presenting the findings of the EIA will be submitted with the DCO Application.
- 1.2.5 The Localism Act 2011, appointed the Planning Inspectorate (the Inspectorate) as the agency responsible for operating the DCO process for NSIPs. In its role, the

Inspectorate will examine the application for the proposed Scheme and then will make a recommendation to the Secretary of State who will make the decision on whether to grant or to refuse the DCO.

- 1.2.6 In accordance with section 104(2) of the PA 2008, the Secretary of State is required to have regard to the relevant National Policy Statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. The relevant NPS for the proposed Scheme is the National Networks National Policy Statement (NNNPS) which was designated in January 2015 (Ref 3).
- 1.2.7 Other matters that the Secretary of State would consider important and relevant include national and local planning policy. The National Planning Policy Framework (NPPF) published in March 2012 (Ref 8) is relevant national planning policy.
- 1.2.8 The Development Plan policy relevant to the proposed Scheme consists of the following adopted plans:
 - a) Wiltshire Council Core Strategy Development Plan Document adopted January 2015 (Ref 4);
 - b) Saved policies of the North Salisbury Local Plan 2011 adopted in 2003 (Ref 5);
 - c) Wiltshire and Swindon Waste Core Strategy Development Plan Document 2006-2026 adopted 2009 (Ref 6); and
 - d) Wiltshire and Swindon Minerals Core Strategy Development Plan Document 2006-2026 adopted 2009 (Ref 7).
- 1.2.9 Section 6 of this EIA Scoping Report describes the national and local planning policies relevant to the assessment with a summary provided for each environmental topic.
- 1.2.10 The purpose of considering the above mentioned planning policy at the scoping stage of the EIA is twofold:
 - a) To identify policy that could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation; and
 - b) To identify planning policy that could influence the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact or the use of a particular methodology.

1.3 The overseeing organisation

- 1.3.1 Highways England is the Applicant and the Strategic Highways Company, as defined in the Infrastructure Act 2015 (Ref 9) charged with modernising and maintaining the highways, as well as running the network and keeping traffic moving.

1.4 Purpose and structure of the scoping report

- 1.4.1 The EIA Regulations set out the requirements for an applicant who proposes to request a scoping opinion from the Secretary of State. Regulation 10(3) of the EIA Regulations requires a scoping report to include:
- A plan sufficient to identify the land;
 - A description of the proposed development, including its location and technical capacity;
 - An explanation of the likely significant effects of the development on the environment; and
 - Such other information or representations as the person making the request may wish to provide or make.
- 1.4.2 The purpose of this EIA Scoping Report (the Scoping Report) is therefore to:
- Provide a summary of the proposed Scheme and alternatives considered to date;
 - Set out the proposed scope of work and methods to be applied in carrying out the EIA; and
 - Set out the proposed structure and coverage of the ES to be submitted with the DCO application.
- 1.4.3 This Scoping Report is set out in accordance with guidance provided in DMRB Volume 11, and the Inspectorate's Advice Note 7 'Screening, Scoping and Preliminary Environmental Information' (Advice Note 7) (Ref 10).
- 1.4.4 Table 1.1 lists the suggested requirements identified in Advice Note 7 and details where they are presented in this Scoping Report. The requirements of the EIA regulations regarding the content of the ES are also covered within the contents tabulated below.

Table 1.1: Contents for the scoping report based on Advice Note 7

Suggested Scoping Report Contents	Location in this Scoping Report
Transboundary Screening Matrix	Appendix A
<p>A plan showing:</p> <ul style="list-style-type: none"> The proposed draft DCO site boundary (identified by a red line) including any associated development; Any permanent land take required for the proposed development; Any temporary land take required for construction, including construction compounds; Any existing infrastructure which would be retained or upgraded for use as part of the proposed development and any existing infrastructure that would be removed; and Features including planning constraints and designated areas on and around the site such as national parks or historic landscapes. 	Figure 2.1 and Figures 6.1, 6.4, 6.5

Suggested Scoping Report Contents	Location in this Scoping Report
A description of the proposed development including both the NSIP and any associated development.	Section 2.3
In dealing with the description of the proposed development and its possible effects on the environment, applicants should: <ul style="list-style-type: none"> • Set out the information using the headings in Schedule 4 of the EIA Regulations; and • Ensure that all aspects of the environment likely to be significantly affected by the development are addressed. 	Section 2 and Section 6
An outline of the main alternatives considered and the reasons for selecting a preferred option.	Section 3
Results of desktop and baseline studies where available.	Section 6
Referenced plans presented at an appropriate scale to convey clearly the information and all known aspects associated with the proposal.	Figure 2.1
Guidance and practice to be relied upon, and whether this has been agreed with the relevant bodies together with copies of correspondence to support these agreements.	Section 4
Methods used or proposed to be used to predict impacts and the significance criteria framework used.	Section 5 and Section 6
Any mitigation proposed and predicted residual effects.	Section 6
Where cumulative development has been identified, how the developer intends to assess these impacts in the ES.	Section 6.12
An indication of any European designated nature conservation sites that are likely to be significantly affected by the proposed development and the nature of the likely significant impacts on these sites.	Section 6.4
Where a developer seeks to scope out matter, a full justification for scoping out such matters, preferably supported by evidence of agreement with the relevant bodies.	Section 6
Key topics covered as part of the developer's scoping exercise.	Section 6
An outline of the structure of the proposed ES.	Section 5.8

1.4.5 A glossary and abbreviations list is presented at the back of this Report.

2 The Proposed Scheme

2.1 The proposed Scheme objectives

- 2.1.1 The proposed Scheme objectives have been formulated both to address the identified problems and to take advantage of the opportunities that new infrastructure would provide. The objectives are defined in the Department for Transport's (DfT's) Client Proposed Scheme Requirements (CSRs) which respond directly to the need for change:
- a) Economic growth – In combination with other proposed Schemes on the route, to enable growth in jobs and housing by providing a free flowing and reliable connection between the South East and the South West peninsula;
 - b) Transport – To create a high-quality route that resolves current and predicted traffic problems and contributes towards the creation of an Expressway between London and the South West;
 - c) Cultural heritage – To contribute to the conservation and enhancement of the WHS by improving access both within and to the site; and
 - d) Environment and community – To contribute to the enhancement of the historic landscape within the WHS, to improve biodiversity along the route and to provide a positive legacy to communities adjoining the road.

2.2 The proposed Scheme

- 2.2.1 The A303 forms one of two strategic routes between South East and South West regions. Together with the A30 and A358, the A303 plays a vital role in supporting the economy of the South West peninsula and the wider South West region. The section of the A303 addressed by this proposed Scheme, and hence within this Scoping Report is between Amesbury and Berwick Down, approximately 11.5km north of the town of Salisbury, in the county of Wiltshire. The location is shown in Figure 2.1.
- 2.2.2 The land potentially required temporarily and/or permanently for the construction, operation and maintenance of the proposed Scheme (hereafter referred to as the proposed draft DCO site boundary) which includes land required for permanent and temporary purposes, is shown in more detail in Figure 2.1. Key heritage, landscape, ecological and water constraints are shown in Figures 6.1, 6.4, 6.5 and 6.7 respectively. It is important to note that the current proposed draft DCO site boundary may be subject to change, but currently captures what is thought to be a reasonable worst-case land take.

2.3 The Rochdale Envelope

- 2.3.1 The Planning Inspectorate's Advice Note 9: Using the 'Rochdale Envelope' ("Advice Note 9") (Ref 11) provides guidance regarding the degree of flexibility that may be considered appropriate within an application for development consent under the PA 2008 (Ref 1). The advice note acknowledges that there may be aspects of the proposed Scheme design that are not yet fixed, and therefore, it may be necessary for the EIA to assess likely worst case variations to ensure that

all foreseeable significant environmental effects of the proposed Scheme have been assessed.

- 2.3.2 This Scoping Report is based on the emerging preliminary design for the proposed Scheme, as described in Section 2.4 below. The proposed Scheme is to be developed further through a reference design stage which will form the basis for the DCO application.
- 2.3.3 Within the reference design there will need to be sufficient flexibility to provide scope for finalising the detailed design and construction methodology in due course. Therefore, when presenting the proposed Scheme design in the ES and the accompanying assessment, the requirements of Advice Note 9 will be complied with to ensure that the likely significant effects of the proposed Scheme are assessed on a reasonable worst case basis.

2.4 Description of the proposed Scheme

- 2.4.1 The preferred route for the proposed Scheme was confirmed by the Secretary of State in September 2017. It commences south east of Yarnbury Castle, near Berwick Down, and follows a general west-east alignment similar to the existing A303, but passing to the north of Winterbourne Stoke, for some 12.6km to finish just east of Solstice Park, Amesbury.

Proposed Scheme components

- 2.4.2 The proposed Scheme is shown in Figure 2.1 and consists of the following principal elements:
- a) A new western section of dual two lane carriageway highway, providing a bypass to the north of Winterbourne Stoke with a viaduct over the River Till Valley;
 - b) A new junction to the west of and outside the World Heritage Site (WHS) accommodating free-flowing A303 and A360 traffic movements, as well as a link to Winterbourne Stoke;
 - c) A new section of dual two lane carriageway highway leading into a twin-bore tunnel within the WHS, past Stonehenge monument;
 - d) An eastern section and new junction between the A303 and A345 accommodating free-flowing A303 and A345 traffic movements, north of Amesbury;
 - e) The existing A303 will be removed within the WHS and replaced with a green byway, and, to the west of the WHS, be detrunked and retained for local access to Winterbourne Stoke; and
 - f) A new High Load Route and diversionary route for the event of both bores of the tunnel being closed. Both routes would leave the A303 at the new Longbarrow Roundabout, run to the north of the A303, then re-join the A303 at Countess Roundabout (for the diversionary route) and the Solstice Park junction (for the High Load Route).
- 2.4.3 As part of the proposed Scheme, the following elements will also be required:

- a) Temporary traffic management areas, temporary working and storage areas, material stockpiles, construction compounds, haul roads, and provision for site compounds to be used during the construction period; and
- b) Enabling works including utility diversions as required.

- 2.4.4 The proposed highway cross-section for the majority of the proposed Scheme length is expected to be formed of two standard 3.65m wide lanes in each direction with a central reserve and a 1m hard strip provision. Outside the tunnel a minimum verge width of 2.5m would be provided in each direction, this would be increased as required to provide the appropriate visibility splays and accommodate any highway features such as signs, vehicle restraint systems, communication equipment, lay-bys etc.
- 2.4.5 At this stage a limited number of variable message signs have been included and Emergency Refuge Areas for use by road users in emergency situations have been located throughout the length on the proposed Scheme, outside the WHS. More detail of the variable message signing, emergency refuge and other communication equipment will be available as the design progresses and the results will be reported in the ES.
- 2.4.6 Street lighting is not currently included in the proposals anywhere along the route except through the tunnels and retention of the existing lighting provision at Countess Roundabout. There would be no surface lighting within the WHS. Confirmation of the provision of lighting in other locations (e.g. at Longbarrow junction) is subject to an appropriate safety assessment and the results reported in the ES.
- 2.4.7 The proposed method of surface water disposal for the proposed Scheme is infiltration. The suitability of this method would be confirmed following ongoing ground water monitoring and the detailed design of the proposed infiltration devices. Details of the proposed drainage arrangements and the provision of appropriate measures for the treatment to mitigate pollution would be developed in parallel with discussions with the Environment Agency and finalised proposals submitted in the ES.
- 2.4.8 New structures required for the proposed Scheme include a twin-bored tunnel under part of the WHS, a new viaduct over the River Till Special Area of Conservation (SAC), grade separated interchanges at the junctions with the A360 and A345 and a number of potential Public Right of Way (PRoW), accommodation and other landscape connectivity features. Development of the form and detail of the structures is ongoing and following consideration during the public consultation will be reported in the ES.
- 2.4.9 The proposed Scheme will remove the existing A303 between Longbarrow crossroads and its junction with Stonehenge Road, Amesbury, and replace it with a 'green' byway through the WHS for non-motorised use, except for occasional access to existing underground services or by farm vehicles. West of Longbarrow junction, the existing A303 will be detrunked and retained for local access to Winterbourne Stoke.

Western Section

- 2.4.10 The proposed Scheme commences on the existing A303 immediately south east of Yarnbury Castle and closely follows the existing A303 alignment for some 2km. It then continues in a north easterly direction providing a bypass to the village of Winterbourne Stoke. Local access continuity from Winterbourne Stoke to the north is maintained by provision of a single span bridge over the existing B3083. The proposed Scheme continues in an easterly direction crossing the River Till valley on a viaduct structure. This structure also provides at-grade crossing points for the bridleway located on the west side of the River Till valley allowing the existing public access routes to be maintained (Figure 2.1).
- 2.4.11 The proposed Scheme continues in an easterly direction following the existing topography crossing the line of the existing A303. A new grade separated dumb-bell shaped junction is proposed immediately east of this crossing point and to the west of the WHS boundary (Figure 2.1). This junction, known as the Long Barrow Junction would accommodate free-flowing A303 and A360 traffic movements, with the A360 crossing over the A303 at a level which reflects the general adjacent ground profile. A link to the detrunked A303 to the west accessing Winterbourne Stoke is also provided from the Long Barrow Junction.

Central Section - The WHS

- 2.4.12 The route then enters the WHS and follows closely the line of the existing A303, to minimise impact on and avoid many important archaeological sites, including the newly-discovered barrows located to the east of the A360. The proposed alignment over this first section, some 1,000 metres, is aligned in a steep sided cutting 5m to 8m below the existing ground level. The western tunnel portal is located such that the road does not intrude on the view of the setting sun from Stonehenge during the winter solstice.
- 2.4.13 The proposed Scheme then continues in an easterly direction following an alignment parallel with the existing A303 offset some 50 metres to the south. For the majority of the section within the WHS the proposed Scheme is aligned in a twin-bore tunnel some 2.9km in length. The western portal is located approximately 1km from the western limit of the WHS south west of Normanton Gorse, and the eastern portal is located to the east of the King Barrow Ridge and the archaeological feature known as the 'The Avenue' (Figure 2.1).
- 2.4.14 Details are yet to be agreed with the various stakeholders but it is anticipated that the existing A303 between Longbarrow Junction and the eastern portal would be converted to a "greenway" open to Non-Motorised Users (NMUs) only. Agricultural and statutory utility access would need to be maintained but vehicular access for this could be gate controlled. The exception would be a 300m length south-west of the Stones between two "byways open to all traffic" (BOATs) where public vehicular access may need to be maintained.

Eastern Section

- 2.4.15 The route continues from the eastern portal closely following the line of the existing A303 to the existing Countess Junction, located immediately to the north of Amesbury. This existing at-grade junction would be improved, within the existing highway boundary, to provide a grade separated junction accommodating

free-flowing A303 and A345 traffic movements. The proposed junction would carry traffic going east-west along the A303 over the traffic going north-south along the A345 Countess Road. The proposed Scheme would then continue east to tie in with the existing A303 close to the existing River Avon Bridge and to the west of Solstice Park Junction (Figure 2.1).

- 2.4.16 Just to the east of Solstice Park junction there are three existing roads with access to the A303. Options for closing or restricting this access are under review and would be reported at consultation.

High Load Route

- 2.4.17 The existing A303 within the proposed Scheme area is identified as a high load route option for vehicles with a maximum height of 6.1m. A restriction to only allow normal height vehicles (including typical buses, coaches and normal height HGVs) within the new twin-bored tunnel is being considered. To facilitate this, it is proposed that the high load route is diverted north of the existing A303. This would be an occasional use route north along the A360 from Long Barrow Junction, then eastward along the Packway, through Larkhill and along the A3028 to Bulford before re-joining the A303 at the Solstice Park junction. Further assessment of the amended high load route and any required works (e.g. local junction upgrades) is being undertaken.

Diversiory Route

- 2.4.18 In the event of the emergency closure of both bores of the proposed tunnel, traffic would be diverted along the High Load Route as far as the A345, where it will travel south to re-join the A303 at Countess Roundabout.

Construction Activities

- 2.4.19 The current proposals allow for temporary traffic management areas, temporary working and storage areas, material stockpiles, construction compounds, haul roads, and provision for site compounds to be used during the construction and post construction maintenance periods. These details are being developed in parallel with the design and further details will be presented for statutory consultation prior to their refinement and assessment in the ES.
- 2.4.20 It is anticipated that the proposed Scheme would be constructed in two main phases:
- a) Phase 1 would be construction of the surface roads, bridges and junctions. The East and West sections would each have independent earthworks balance, i.e. the embankments would be constructed using material excavated from cuttings. At the end of Phase 1 traffic could then be diverted on to the Winterbourne Stoke Bypass, but would remain on the existing A303 from Long Barrow Junction to Countess Junction.
 - b) Phase 2 would be to construct the tunnel and cross passages. It is likely that a Tunnel Boring Machine (TBM) would be used. This would be launched from the western end of the tunnel. A TBM cannot be reversed down its own tunnel so it would then need to either be turned around to construct the second bore from east to west or disassembled and transported back to Long Barrow Junction to bore from west to east. Spoil arising from the tunnel

would be extracted at the western portal and used for environmental mitigation and landscaping or habitat enhancements as far as reasonably practicable. Any excess spoil would be managed in accordance with the principles of the waste hierarchy and any relevant waste management regulations.

Timescales

- 2.4.21 Statutory Consultation for the proposed Scheme is planned to take place in early 2018, and following assessment of the consultation feedback and appropriate design amendments and EIA, the formal DCO application is planned for late 2018. Subject to successfully passing through the DCO process it is intended to commence construction in 2021, with the year of opening anticipated to be 2026.
- 2.4.22 In terms of the temporal scope of the assessment, the current date for opening (i.e. Year 0) is December 2026; in line with the traffic assessment, it is proposed that operational effects be assessed at Year 0 and Year 15. Further topic-specific details are provided in Chapter 6.

3 Assessment of alternatives

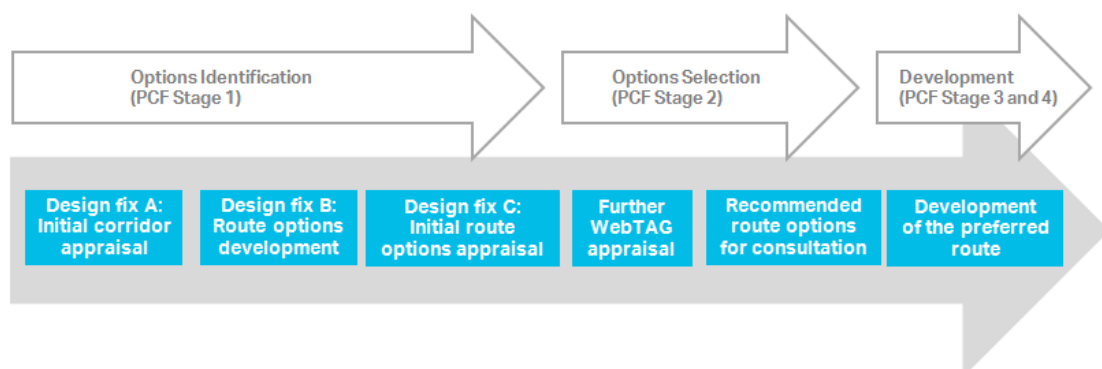
3.1 Proposed Scheme History

- 3.1.1 Proposals for the improvement of the A303 between Amesbury and Berwick Down have been the subject of extensive study and consultation since 1991.
- 3.1.2 In 2013, HM Treasury's Investing in Britain's Future (Ref 12) set out a programme of infrastructure investment, including provision for a feasibility study for the A303/A30/A358 (Ref 13). That study concluded that the problems experienced along the corridor should be addressed through the introduction of a number of new dual carriageway sections, including the A303 Amesbury to Berwick Down.
- 3.1.3 Following the completion of the feasibility study in December 2014, the Department for Transport published its Road Investment Strategy for 2015-20 (Ref 126) containing proposals for creating an A303/A358 dual-carriageway to the South West, including dualling of the A303 from Amesbury to Berwick Down (the proposed Scheme) with a twin-bored tunnel at least 2.9km long through the WHS.

3.2 Selection of the Proposed Scheme

- 3.2.1 The process of option identification and selection undertaken for the proposed Scheme is summarised below. This is split into four Highways England Project Control Framework (PCF) stages as shown in Figure 3.1: Option identification and selection process

Figure 3.1: Option identification and selection process



Option identification

- 3.2.2 A three-stage process of options identification and sifting was undertaken to identify shortlisted route options for detailed appraisal:
- Design Fix A - Corridor identification and initial sifting of corridors;
 - Design Fix B - Design development of route options within preferred corridors; and
 - Design Fix C - Initial appraisal and sifting of route options to identify options to take forward for appraisal.

- 3.2.3 This was followed by the selection of two preferred routes, Option 1N and Option 1S, which were taken to non-statutory public consultation in January/March 2017, followed by the selection of a preferred route which was announced by the Secretary of State in September 2017 to form the 'proposed Scheme'. Table 3.1 below summarises the option identification and selection process that has led to the specification of these preferred routes.

Table 3.1: Development of the Proposed Scheme (Ref 14)

Option Identification Stage	Details
Design Fix A - Corridor identification and initial sifting of corridors;	<p>A review of 60 route options was undertaken. These options were grouped into seven separate corridors:</p> <ul style="list-style-type: none"> • Corridor A – surface routes more than 1km north of the existing A303 (outside Stonehenge WHS); • Corridor B – surface routes more than 1km north of the existing A303 (at least partially within Stonehenge WHS); • Corridor C – surface routes within 1km of the existing A303 (at least partially within Stonehenge WHS); • Corridor D – partially tunnelled route options within 1km (on plan) of the existing A303 (at least partially within Stonehenge WHS); • Corridor E – surface routes more than 1km south of the existing A303 (partially within Stonehenge WHS); • Corridor F (north) – surface routes south of the existing A303 (wholly outside WHS) and north of Salisbury. • Corridor F (south) – surface routes south of the existing A303 (wholly outside WHS) and north of Salisbury, further south than Corridor F (north); and • Corridor G – surface routes south of A303 (outside Stonehenge WHS) and south of Salisbury. <p>A multi-criterion assessment was carried out to recommend better performing corridor(s) to be taken forward for further consideration. The outcome of this process was a recommendation that Corridor D, Corridor F (north) and Corridor F (south) be taken forward for further consideration.</p>
Design Fix B - Design development of route options within preferred corridors;	<p>Design Fix B involved developing route options within the corridors identified from Design Fix A and rationalising them based on impacts on the key constraints.</p> <p>A total of ten route options were developed for further appraisal, seven within Corridor D and three within Corridor F. The options within Corridor D incorporated varying lengths of tunnel (2.9km or 4.5km), different locations for the tunnel portals, as well as a northern or southern bypass of Winterbourne Stoke. The three route options within Corridor F largely represented a northern, central and southern option.</p>

Option Identification Stage	Details
Design Fix C - Initial appraisal and sifting of route options to identify options to take forward for appraisal.	<p>Following a further appraisal the following options were taken forward:</p> <ul style="list-style-type: none"> • Option D061: was a part surface / part tunnelled route of total length 12.5km which included a 2.9km tunnel through part of the Stonehenge WHS and a bypass to the north of Winterbourne Stoke. The proposed western portal was located approximately 80m south west of Normanton Gorse, and the eastern portal is located approximately 80m east of The Avenue; • Option D062: was a part surface / part tunnelled route of total length 12.6km which included a 2.9km tunnel through part of the Stonehenge WHS and a bypass to the south of Winterbourne Stoke. The proposed western portal was located approximately 80m south west of Normanton Gorse, and the eastern portal was located approximately 80m east of The Avenue; • Option F010: the route leaves the A303 in the west and ran between Winterbourne Stoke and Berwick St. James. The route then continued east, keeping south of the WHS boundary but north of Upper Woodford. The route then ran south of the Boscombe Down Airfield before connecting back to the existing A303 dual carriageway east of Amesbury.
Recommended Route Options for Consultation	<p>Following on from Design Fix C, and further WebTAG appraisal and assessment, the two route alignments within Corridor D, namely D061 and D062 were identified as the preferred route options for consultation on the basis that they performed better against client proposed Scheme requirements (CSR) and the relevant national and local policy objectives than F010).</p> <p>Description of Option D061 and D062 are provided below:</p> <ul style="list-style-type: none"> • Route Option D061 (Published as 'Option 1N' for consultation): 2.9km length tunnel with route running north of Winterbourne Stoke, the eastern tunnel portal located east of The Avenue and the western tunnel portal located west of Normanton Gorse. • Route Option D062 (Published as 'Option 1S' for consultation) – 2.9km length tunnel with route running south of Winterbourne Stoke, the eastern tunnel portal located east of The Avenue and the western tunnel portal located west of Normanton Gorse.
Development of Modified Routes	<p>In response to the findings of archaeological surveys and feedback received during the non-statutory consultation held between January and March 2017 (Ref 15) seven modifications were made to Options 1N and 1S which were 1Na, 1Nb, 1Nc, 1ND, 1Sa, 1Sb and 1Sc.</p>

Option Identification Stage	Details
Identification of a Preferred Route	<p>All modified routes were subject to a high level review that screened the options against key considerations raised from the public consultation, and the associated key engineering and environmental assessment topics, as well as the results of further geophysical surveys, to identify the better performing route options. The outcome of this review was that Option 1Na, 1Nd and 1Sa performed better than the other options and were therefore shortlisted for more detailed WebTAG appraisal.</p> <p>Based on the detailed WebTAG appraisal of the modified route options following the public consultation, Option 1Nd was identified as the recommended Preferred Route. This option attracted greater public support than the route to the south and performed better from a heritage, landscape and biodiversity perspective, and provides greater potential for impacts to be mitigated compared to Option 1Na and 1Sa. Option 1Nd also performed better in the engineering assessment as it was a slightly shorter route.</p> <p>However, Option 1Nd has been modified further (Ref 16), and the route through the western part of the WHS has been altered in line with consultation responses. The western portal has been moved closer to the existing A303 to mitigate impacts on archaeology and the RSPB reserve at Normanton Down.</p>

3.3 Development of the proposed Scheme

- 3.3.1 Highways England announced the Preferred Route for the proposed Scheme on 12 September 2017.
- 3.3.2 Design development is ongoing, and is being informed by the iterative EIA process, consultation and evolving knowledge of the environment that would be affected by the proposed Scheme. Elements of the design which will be developed through the autumn and winter of 2017 include, but are not limited to:
- a) River Till overbridge;
 - b) B3083 overbridge;
 - c) Long Barrow junction layout;
 - d) Tunnel service buildings;
 - e) Tunnel technology;
 - f) Countess junction layout;
 - g) Site compounds and laydown areas;
 - h) Enhancement and compensation areas;
 - i) Emergency and maintenance crossing points;
 - j) Drainage strategy;
 - k) Lighting;

- l) Technology and signage; and
- m) Landscape/earthworks design.

3.3.3 The design development will pay due regard to the principles of good design, outlined in the NNNPS (Ref 17).

4 Consultation

4.1 Context

- 4.1.1 Effective stakeholder engagement and consultation is intrinsic to the PA 2008 and fundamental to the success of the proposed Scheme.
- 4.1.2 The proposed Scheme has a wide range of stakeholders (including landowners, statutory consultees, local communities and specialist interest groups) with differing interests that will require varied levels of information. Specific communication activities therefore need to be focussed to meet the needs of particular individuals and groups. This requires an understanding of the stakeholders and their interest in the proposed Scheme.
- 4.1.3 Stakeholder engagement for the proposed Scheme is based on the following principles:
- a) Early and ongoing engagement to inform and influence the proposed Scheme development process;
 - b) Seeking an appropriate level of feedback at each stage in the iterative design process and ensuring that comments received are taken into consideration;
 - c) Building of long term relationships with key stakeholders throughout the different stages of the proposed Scheme to help better understand their views;
 - d) Where possible and practicable ensuring concerns are addressed; and
 - e) Ensuring appropriate statutory consultation is undertaken in compliance with requirements of the PA 2008 and associated guidance.

4.2 DCO Consultation Requirements

- 4.2.1 The DCO process has a number of statutory requirements regarding consultation. These requirements stipulate that certain stakeholder groups and the community must be consulted as part of the pre-application process, as set out in Sections 42 and 47 of PA 2008 (Ref 1). Further requirements set out how the proposed Scheme must be publicised and specific documents produced, including a Statement of Community Consultation (SoCC) and a Consultation Report.

4.3 Consultation to date

- 4.3.1 Stakeholders have long been involved in proposed improvements in the A303/A30/A358 corridor as part of the history of the development of the proposed Scheme.
- 4.3.2 Non-statutory public consultation on Options 1N and 1S involving a 2.9km tunnel and northern and southern options to bypass Winterbourne Stoke took place between January and March 2017. The purpose of this consultation was to seek feedback from the stakeholders, including the local community, on the two options identified via the options identification and selection process. The

responses to this consultation were taken into account in the identification of the recommended preferred option as documented in the consultation report (Ref 15) and Preferred Route Announcement Brochure (Ref 16).

- 4.3.3 In addition to the non-statutory consultation, significant ongoing engagement has taken place between the project team and key stakeholders including local landowners, local authority, statutory consultees and heritage groups.
- 4.3.4 Working groups have been set up with key stakeholders associated with a number of the work areas including heritage, landscape and biodiversity. These are advisory groups and allow the project to work closely with stakeholders as the design develops.

4.4 Statutory consultation

- 4.4.1 The Planning Inspectorate will consult on this Scoping Report under the EIA Regulations. Views from consultees will be considered and used to inform the Scoping Opinion to be issued by the Planning Inspectorate.
- 4.4.2 Under Section 42 of the PA 2008, Highways England will conduct its own consultation with statutory environment bodies (Natural England, the Environment Agency and Historic England), the relevant planning authorities (Wiltshire Council), landowners, and other key consultees.
- 4.4.3 The local community and wider public will be consulted on the proposed Scheme via a statutory consultation programme in accordance with Section 47 of the PA 2008. The statutory consultation programme is expected to run from February to April 2018 and will be carried out in accordance with the SoCC which is currently being developed and will be consulted upon.
- 4.4.4 The approach to Section 47 consultation is currently being finalised, but is likely to include (without being limited to):
 - a) Exchanges of correspondence, meetings and workshops with local community groups and businesses;
 - b) Publication of leaflets, reports and other information made available in the local area and online; and
 - c) Public exhibitions at which members of the community can meet with members of the project team.
- 4.4.5 The purpose of this consultation will be to seek comments from the local community and statutory and technical consultees on the proposed Scheme. The consultation will include the provision of environmental information contained within the Preliminary Environmental Information Report (PEI Report).
- 4.4.6 Feedback received during the consultation will be taken into consideration by the project team and summarised in a Consultation Report that will be submitted as part of the DCO application.

5 Approach to the assessment

5.1 The Design Manual for Roads and Bridges

- 5.1.1 Guidance published by the Government for the preparation of environmental assessments of proposed road Schemes is contained in the Design Manual for Roads and Bridges (DMRB) Volume 11 (Ref 127). This sets out both the general process and the methods for assessing individual environmental topics. This Scoping Report adheres to Interim Advice Note (IAN) 125/15 Environmental Assessment Update (Ref 18), which provides a new structure of DMRB Volume 11.
- 5.1.2 DMRB Volume 11 advises on the environmental topics to be included in an EIA, and the methods to be used in the assessment for each of those topics. The topics identified in Section 6 of this Scoping Report are those required by DMRB and by the EIA Regulations.
- 5.1.3 The EIA will adhere to the most up-to-date, relevant guidance contained in DMRB and Highways England IANs. More details of the methods to be used for each individual topic are provided in Section 6 of this Scoping Report. Should any revisions to IANs or DMRB be issued between scoping and reporting of the EIA, they will be adopted where appropriate, provided that it is reasonable to do so within the programme and governance for the project. Any changes in environmental legislation, such as for example the EIA Regulations, will be mandatory, and therefore accommodated.
- 5.1.4 For each topic, the Scoping Report and ES will consider the aspects outlined below in Sections 5.2 – 5.8.

5.2 The National Networks National Policy Statement

- 5.2.1 Strategic roads have their own policy framework, with relevant policy objectives set out in the NNNPS. The NNNPS is framed in the context of wider Government policies on environment, safety, technology, sustainable transport and accessibility. It provides planning guidance for promoters of NSIPs on the road network, and the basis for the examination by the Examining Authority and decisions by the Secretary of State. The Secretary of State will use the NNNPS as the primary basis for making decisions on development consent applications for national networks NSIPs in England. Given the importance of the NNNPS, the EIA approach adopted for the proposed Scheme takes account of this key policy document. The EIA will have regard to the methodological advice within Chapter 5 of the NNNPS.

5.3 Existing, baseline and future conditions

- 5.3.1 In order to identify the effects of the proposed Scheme on the environment, it is important to understand the environment that would be affected by the proposed Scheme (the 'baseline conditions'). Understanding the baseline allows the measurement of changes that would be caused by the proposed Scheme.

- 5.3.2 The baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the proposed Scheme either (a) at the time that construction is expected to start, for impacts arising from construction or, (b) at the time that the proposed Scheme is expected to open to traffic, for impacts arising from the operation of the proposed Scheme. Therefore the identification of the baseline conditions involves predicting changes that are likely to happen in the intervening period, for reasons unrelated to the proposed Scheme. This will entail taking current conditions and committed development into consideration and using experience and professional judgment to predict what the baseline conditions might look like prior to start of construction and operation.

5.4 Potential significant effects and mitigation

Defining Assessment Years and Scenarios

- 5.4.1 The assessment of effects involves comparing a scenario with the proposed Scheme against one without the proposed Scheme over time. The absence and presence of a proposed Scheme are referred to as the 'Do Minimum' and 'Do Something' scenarios respectively. The 'Do Minimum' scenario represents the future baseline with minimal interventions and without new infrastructure.
- 5.4.2 Depending on the topic, the effects would be assessed for the 'Do Minimum' and 'Do Something' scenarios in the baseline year (assumed to be 2026 for the purposes of the ES) and the future assessment year (assumed to be 15 years after opening).

Demolition after design life

- 5.4.3 It is considered highly unlikely that the proposed Scheme would be demolished after its design life as the road is likely to have become an integral part of the infrastructure in the area. In the unlikely event of Scheme demolition, this would be part of the relevant statutory process at that time, including EIA as appropriate. It is therefore proposed that demolition of the proposed Scheme is scoped out of the EIA.

Identifying Potential Effects

- 5.4.4 The EIA Regulations require: "The description of the likely significant effects" of the proposed Scheme on the environment, covering "the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.
- 5.4.5 The technical scope of the ES is identified in Section 5.6 and Chapter 6 presents the details of our proposed topic-specific approach.

Assessing significance

- 5.4.6 The significance of an environmental effect is typically a function of the 'value' or 'sensitivity' of the receptor and the 'magnitude' or 'scale' of the impact.
- 5.4.7 DMRB Volume 11, Section 2, Part 5 HA 205/08 'Assessment and Management of Environmental Effects' provides advice on typical descriptors of environmental

value, magnitude of change and significance of effects. Tables 5.1 to 5.4 reproduce these descriptors and demonstrate how the significance of effect category can be derived. Assessments against these criteria will be made on the basis of professional judgement.

Table 5.1: Environmental value (or sensitivity) and typical descriptors

Value	Typical Descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Table 5.2: Magnitude of change and typical descriptors

Magnitude of Change	Typical Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Low or medium importance and rarity, local scale.
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

5.4.8

Table 5.3 demonstrates how combining the environmental value of the resource or receptor with the magnitude of change produces a significance of effect category.

Table 5.3: Significance of effects matrix

Magnitude of Change	Value/Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
Major	Very Large	Large/ Very Large	Moderate /Large	Moderate	Slight

Value/Sensitivity of Receptor					
Magnitude of Change	Very High	High	Medium	Low	Negligible
Moderate	Large/ Very Large	Moderate/ Large	Moderate	Slight	Neutral
Minor	Moderate/ Large	Moderate	Slight	Neutral	Neutral
Negligible	Slight	Slight	Neutral	Neutral	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

5.4.9 The DMRB recognises “the approach to assigning significance of effect relies on reasoned argument, professional judgement and taking on board the advice and views of appropriate organisations. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale, in order to assist the decision-making process at whatever stage the project is at within that process”.

5.4.10 Table 5.4 illustrates how the DMRB describes the significance of effect categories. In arriving at the significance of effect, the assessor will also consider whether they are direct, indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, positive or negative.

Table 5.4: Descriptors of the significance of effect categories

Significance Category	Typical Descriptors of Effect
Very large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change (e.g. loss or severe damage to key characteristics) in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

5.4.11 Effects determined to be slight or neutral are not deemed to be significant, and as such will not be reported in detail in the ES and will not require specific mitigation. The exception to this is where the combination of multiple slight effects has the potential to lead to a significant (i.e. moderate or above) cumulative effect.

- 5.4.12 Not all of the environmental topics will use the above criteria or approach. For example, some topics do not use a matrix based approach but instead use numerical values to identify impacts (e.g. Noise and vibration) and some topics do not have agreed methods of assessment or scales of measurement for either value or sensitivity (e.g. Geology and soils). Therefore, each environmental topic specialist will use the information provided above, their topic specific guidance as well as their professional judgement to assess the significance of effects. However, irrespective of the criteria or approach that a topic requires, the descriptors of significance listed in Table 5.4 will be used.
- 5.4.13 Further details of the topic specific significance criteria that will be used in the ES are discussed in Sections 6.1 to 6.11 of this Report.

Mitigation measures, enhancements and residual effects

- 5.4.14 The EIA will take into account any design measures that have been incorporated into the proposed Scheme design, as well as any standard management activities that the proposed Scheme will implement.
- 5.4.15 Mitigation of potentially significant adverse environmental effects will be an iterative part of the proposed Scheme development following the hierarchy below:
- a) Avoidance – incorporate measures to avoid the effect, for example, alternative design options or modifying the proposed Scheme programme to avoid environmentally sensitive periods.
 - b) Reduction – incorporate measures to lessen the effect, for example, fencing off sensitive areas during construction and implementing a Construction Environmental Management Plan (CEMP) to reduce the potential impacts from construction activities.
 - c) Compensation/Remediation – where it is not possible to avoid or reduce a significant effect then offsetting measures should be considered, for example the provision of replacement of habitat to replace that lost to the proposed Scheme or remediation such as the clean-up of contaminated soils.
 - d) Enhancement – where possible enhancement measures will be incorporated into the proposed Scheme. Enhancement measures are considered to be over and above any avoidance, mitigation and compensation measures required to neutralise the impacts of the proposed Scheme.
- 5.4.16 Impacts that remain after mitigation are referred to as residual impacts. The assessment of the significance of the residual effects after mitigation/enhancement is therefore the key outcome of the assessment.

Assessment of cumulative effects

- 5.4.17 Cumulative effects are the result of multiple impacts on environmental receptors or resources. There are principally two types of cumulative impact:

- a) The combined action of a number of different environmental topic specific impacts upon a single resource/receptor (in combination); and
- b) The combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor (cumulative).

5.4.18 Further details on the scope of the cumulative effects assessment is provided in Section 6.11.

5.5 Proposed level and scope of the assessment

5.5.1 This section addresses the level at which environmental topics are to be examined, i.e. a 'Simple' or 'Detailed assessment', and establishes which can be 'scoped out' (basic assessment) in accordance with the guidance set out in Annex A of IAN125/15.

5.5.2 Study areas are defined individually for each environmental topic, according to the guidance in DMRB and the geographic scope of the potential impacts or of the information required to assess those impacts.

5.6 Technical scope

5.6.1 The environmental topic areas to be considered, the extent of the assessment work proposed and the methodology for each are referred to as the technical scope. The EIA Regulations require the ES to describe the likely significant effects of the proposed Scheme on the environment resulting from:

- a) "the construction and existence of the development, including, where relevant, demolition works;
- b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;
- c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;
- d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);
- e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;
- f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;
- g) the technologies and the substances used."

5.6.2 The environmental topic areas proposed for inclusion in the ES are as follows:

- a) Air quality;

- b) Cultural heritage;
- c) Landscape;
- d) Biodiversity;
- e) Geology and soils;
- f) Road drainage and the water environment;
- g) Materials;
- h) Noise and vibration;
- i) People and communities;
- j) Climate; and
- k) Combined and cumulative effects.

5.6.3 The assessment of impacts of the proposed Scheme on human health is a function of the following topics: air quality, noise and vibration, people and communities, and road drainage and the water environment. As such, human health impacts are “in combination” impacts and are considered under the Cumulative Effects heading.

5.7 Major events

Legislative Requirements

- 5.7.1 The latest EIA Regulations have introduced a requirement to consider major accidents and disasters.
- 5.7.2 It is considered likely that the original changes to the EIA Directive to consider major events were made in order to bring certain other statutory requirements, mainly other EU Directives, within the overall ‘wrapper’ of EIA and the ES. The Directive and domestic Regulations cite two specific directives as examples of risk assessments to be brought within EIA, these are Directive 2012/18/EU of the European Parliament and of the European Council (which deals with major accident hazard registered sites) and Council Directive 09/71/Euratom (which deals with nuclear sites). Neither of these Directives is relevant to the proposed Scheme.

Highways England Guidance

- 5.7.3 In May 2017 Highways England issued Major Project Instructions (version number MPI-57-052017) (Ref 128) which set out how the changes brought about by the 2017 EIA Regulations are to be implemented for Highways England projects. As such, these instructions set out the proposed scope of assessment in relation to major events (‘events’ being the collective term used in the instructions for both accidents and disasters). This general scope should cover:
 - a) Vulnerability of the project to risks of major accidents and/or disasters; and

- b) Any consequential changes in the predicted effects of that project on environmental topics.

5.7.4 To achieve this, the instructions identify that projects should:

- a) Apply professional judgement in consultation with the Overseeing Organisation to develop project specific definitions of major events;
- b) Identify any major events that are relevant to and can affect a project;
- c) Where major events are identified, describe the potential for any change in the assessed significance of the project on relevant environmental topics in qualitative terms. Report the conclusions of this assessment within the individual environmental topics; and
- d) Clearly describe any assumed mitigation measures, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated/managed to an acceptable level.

5.7.5 The potential receptors of effects resulting from major events are all reported in the relevant topic chapter, and as such major events is not a topic in itself. The Highways England instruction confirms that a separate chapter is not required. Relevant major events are therefore reported in this methodology section, and any consequences for receptors are reported in each of the topic chapters.

Methodology

5.7.6 The methodology adopted includes three main stages, as follows:

- a) Stage 1: a long list of all possible major events was developed. This list drew upon a variety of sources, including the UK Government's Risk Register of Civil Emergencies. Major events with little relevance in the UK were not included. Stage 1 also included an initial review of potential receptors to identify any groups that it was not considered necessary to include in the assessment.
- b) Stage 2: a screening exercise was undertaken to review the long list of major events and to give consideration to their relevance to the proposed Scheme, and therefore whether they should be included on the project specific short list of events requiring further consideration, including by topic specialists.
- c) Stage 3: where further design mitigation is unable to remove the potential interaction between a major event and a particular topic, the relevant ES chapter will identify the potential consequence for receptors covered by the topic, and give a qualitative evaluation of the potential for the significance of the reported effect to be increased as a result of a major event.

Assessment findings

Stage 1

5.7.7 A copy of the long list of major events is provided in Appendix B. Although the majority of these major events are already considered under other legislative or

design requirements, this is not considered to be sufficient reason to automatically eliminate the major event from any further consideration. This is consistent with the approach, for example that the need to comply with nature conservation legislation does not mean that ecology and nature conservation do not need to be considered in EIA. However, where it is concluded that the need for compliance is so fundamental, and the risk of any receptors being affected differently so remote, major events on the long list may not need to be included on the shortlist.

5.7.8 Likewise, it is considered reasonable and proportionate to exclude certain receptor groups from the outset. Construction workers, as a receptor, can be excluded from the assessment, because existing legal protection is considered to be sufficient to minimise any risk from major events to a reasonable level. Legislation in force to ensure the protection of workers in the workplace includes:

- a) Health and Safety at Work etc. Act 1974 (HSWA);
- b) The Management of Health and Safety at Work Regulations (1999);
- c) The Workplace (Health, Safety and Welfare) Regulations 1992; and
- d) Construction (Design and Management) (CDM) 2015 Regulations.

5.7.9 Another potential source of major events related to the proposed Scheme is road traffic accidents. These can clearly impact on people though fatalities and serious injury, but can also impact on the environment, through the spillage of hazardous loads. However, for the proposed Scheme the Stage 2 Economic Appraisal Report (Ref 19) identified that there would be an overall reduction in the number of accidents. The Economic Appraisal Report states that:

“The accident and safety impacts were assessed quantitatively ... The assessment demonstrates that all options will reduce accidents due to the replacement of the existing single carriageway with a grade-separated dual carriageway. It is estimated that the scheme would save six accidents per year over the appraisal period”.

5.7.10 As such, although the ES will still consider the risk of spillages, as required under DMRB Volume 11 the potential for accidents to affect people, as receptors under the topic of human health, is not considered further.

Stage 2

5.7.11 In general major events, as they relate to the proposed Scheme, will fall into three categories:

- a) Events that could not realistically occur, due to the type of Scheme or its location;
- b) Events that could realistically occur, but for which the proposed Scheme, and associated receptors, are no more vulnerable than any other development; and

- c) Events that could occur, and to which the proposed Scheme is particularly vulnerable, or which the proposed Scheme has a particular capacity to exacerbate.

5.7.12 The screening stage was undertaken to try to identify this third group of major events, which would then form the shortlist of events to be taken forward for further consideration.

5.7.13 This screening stage included a workshop attended by a number of topic specialists and a representative of Highways England. Topic specialists who attended were those whose topic would be most likely to interact with major events.

Stage 3

5.7.14 Stage 2 of the assessment resulted in a short list of major events that are considered to need further consideration at Stage 3, though this may only mean that the risk needs to remain on the design risk register until it is closed out through design. Specific major events that have been included on the short list and will be considered in more detail are presented in Table 5.5, though it is considered unlikely that any will need to be considered further in any of the technical assessment, unless they are already included in the ES.

Table 5.5: Major Events Shortlisted for Further Consideration

Major Event	Reason for consideration on Short List	Potential Receptors
Sinkholes	Although this is likely to be covered in the geotechnical design, there are sufficient examples of roads that have been affected by sinkholes to warrant taking this event forward.	Road users
Floods	Both the vulnerability of the project to flooding, and its potential to exacerbate flooding, are to be covered in the Flood Risk Assessment and will also be reported in EIA terms in the of the ES, both in terms of the risk to the proposed Scheme and increased risk due to the proposed Scheme.	Road users, property and people in areas of increased flood risk.
Thunderstorms	As the bridge is elevated, some consideration will be given to the potential risk of lightning strikes, though the risk is not considered to be any greater than any other road bridge, and the consequences are unlikely to be significant.	Road users
Heat waves (see Climate Section 6.10)	Some consideration will be given to the potential for the tunnel to be more sensitive to heat wave conditions, though it is likely that a tunnel will be less sensitive than the open road, which is directly exposed to the sun.	Road users
Wildfires	There may be some potential for scrub, grassland or heather fires, though the risk is no greater than the existing road. The reduced accident rate means the risk of an RTA causing a fire is actually reduced.	Road users, habitats and species.
Air Quality Events	Although relevant, as vehicles emissions can contribute to poor air quality, it is not considered necessary to undertake any more assessment than is already proposed for the Air Quality assessment.	Road users and local residents

Major Event	Reason for consideration on Short List	Potential Receptors
Solar flare	Solar flares can interrupt radio and other electronic communications. The increased reliance on roadside technology could mean the proposed Scheme is more vulnerable than the existing route.	Road users
Road Accidents	The risk posed by spillage from hazardous loads as a result of a road traffic accident e.g. fuel tankers will be considered in the Road Drainage and Water Environment Chapter. Although military vehicles may use the road, they already use the existing road, and given the reduced accident rate, it is unlikely that there will be any increase in relation to Major Events.	Road users, aquatic environment.
Aircraft Disasters	Although there is an RAF base in the vicinity, it is to the east of Amesbury, and there is not considered to be an increased risk to road users. Any increase in bird strike as a result of the proposed Scheme will need to be considered however.	Road users, pilots and aircraft.
Bridge Failure	A bridge crossing forms part of the design.	Road users
Tunnel Failure or Fire	There is a tunnel as part of the design.	Road users
Dam Failure	Could lead to flooding of the road, but already considered in the Flood Risk Assessment.	Road users
Flood Defence Failure	Could lead to flooding of the road, but already considered in the Flood Risk Assessment.	Road users
Mast and Tower Collapse	Design out through separation distances for wind turbines etc.	Road users
Utilities failure (gas, electricity, water, sewage, oil, communications)	There is a high pressure gas pipeline present, and possibly other utilities. Need confirmation that all utilities safely crossed or diverted.	Road users
Mining Industry	Potential for current or past mining activity in the vicinity to lead to unstable ground conditions.	Road users
Military Accidents	There is a significant amount of military activity in the area, including military vehicles using the existing road and which will also use the proposed scheme. There is also a military base and munitions storage in relatively close proximity to the proposed scheme. There remains some potential for interaction with the proposed scheme during construction and operation and this will need to be given further consideration.	Road users and local residents
Bomb/vehicle attack on people	Possibility that inclusion of a tunnel will make the road more of a target for a terrorist attacks.	Road users
Bomb/vehicle attack on Infrastructure	Possibility that inclusion of a tunnel will make the road more of a target for a terrorist attacks.	Road users
Cyber attacks	The increasing reliance on roadside technology could render the proposed Scheme more vulnerable to a cyber-attack.	Road users

5.7.15 Where events identified above are not already being considered within existing ES chapters, they will continue to be reviewed with the design team to ensure the risks are understood and addressed through design as necessary. However it is considered highly likely that all of these major event types will be able to be

removed from the scope of the assessment prior to publication of the ES, as the design will ensure there is no real risk or serious possibility of the event interacting with the proposed Scheme. All such scoping out will be reported in the ES.

5.8 Human health

Scope of Assessment

5.8.1 There is no consolidated methodology or practice for this topic, however the scope of the assessment is considered to be covered by existing Highways England Guidance as set out below. This recognises the specific requirements of the NN NPS for consideration of health, specifically within paragraphs 4.79-4.82. This will address health by utilising the following guidance:

- a) Air Quality: HA 207/07 (Ref 23), IAN 185/15 (Ref 21), IAN 175/13 (Ref 22), IAN 174/13 (Ref 23), IAN 170/12 (Ref 24);
- b) Noise and vibration: HD 213/11 (Ref 129), IAN 185/15 (Ref 21);
- c) Road Drainage & The Water Environment HD 45/09 (Ref 25); and
- d) Equestrians, Cyclists, and Community Effects: DMRB Volume 11 Section 3 Part 8 (Ref 26).

5.8.2 It is considered that these assessments, conducted principally in isolation as is required by their methodologies, will not provide a sufficient analysis of the effects of the proposed Scheme. To enable such conclusions to be drawn, a qualitative assessment of information collated via the topic assessment listed above will be undertaken and presented within the Cumulative Effects section of the ES. Potential health effects of specific issues will also be reported within the relevant ES topic chapters.

Methodology

5.8.3 The ES will set out the assessment methodology recognising the requirements of the NNNPS (paragraph 4.81), including how significance of effects are to be determined.

5.9 Structure of the Environmental Statement

5.9.1 Table 5.6 below presents an indicative structure of the ES for the proposed Scheme. While this represents the currently envisaged structure of the ES, it should be recognised that the final structure may vary as a result of decisions made or needs recognised in the course of implementing the work.

Table 5.6: Indicative structure of the environmental statement

Chapter	Potential Sections
Non-Technical Summary	
Volume 1: Main Text	

Chapter	Potential Sections
1. INTRODUCTION	Purpose of the Report Overview of the Project Legislative and Policy Framework Competent Expert Evidence
2. THE PROJECT	Need for the Project Project Objectives Project Location Baseline Scenario Project Description Construction, Operation and Long Term Management Demolition
3. ASSESSMENT OF ALTERNATIVES	Assessment Methodology Reasonable Alternatives Studied Justification for the Chosen Option
4. ENVIRONMENTAL ASSESSMENT METHODOLOGY	Environmental Scoping Surveys and Predictive Techniques and Methods General Assessment Assumptions and Limitations Significance Criteria Duplication of Assessment
5. ASSESSMENTS (FOR EACH ENVIRONMENTAL TOPIC SCOPED INTO THE ASSESSMENT))	Competent Expert Evidence Legislative and Policy Framework Study Area Baseline Conditions Potential Impacts Assessment Methodology Assessment Assumptions and Limitations Design, Mitigation and Enhancement Measures Assessment of Effects Monitoring
6. ASSESSMENT OF CUMULATIVE EFFECTS	Cumulative Assessment Methodology Assessment of Combined Effects Assessment of Cumulative Effects Monitoring
7. SUMMARY	
8. REFERENCES AND GLOSSARY	
Volume 2: Plans and Drawings	
Volume 3: Technical Appendices	

Supporting information

5.9.2 The following will be prepared as standalone documents submitted with the DCO application:

- a) Water Framework Directive Report;
- b) Groundwater Assessment;
- c) Flood Risk Assessment (FRA);

- d) Heritage Impact Assessment for the WHS undertaken in accordance with ICOMOS guidance; and
- e) Habitat Regulations Assessment (HRA).

The above documents will be co-ordinated with the EIA and ES Chapters to minimise duplication of information between assessments.

5.10 Assumptions and limitations

5.10.1 In undertaking this Scoping exercise the following generic assumptions have been made:

- a) the Scoping Report has been prepared based on the environmental baseline information available at the time of writing, the design as described in Chapter 2 and the proposed draft DCO site boundary presented in Figure 2.1. Further information will become available as the iterative design and assessment process proceeds and the scope of assessment will be kept under review in light of this;
- b) detailed construction methodologies, including those associated with tunnelling, are unknown at present; and
- c) details of site compounds and materials storage have not yet been identified. The assumption is that the main compound would be located outside of the WHS with satellite compounds located either within the proposed Scheme footprint or in close proximity. The proposed draft DCO site boundary presented in Figure 2.1 incorporates the currently anticipated requisite areas for these activities.

6 Assessment of Effects

6.1 Air Quality

Introduction

- 6.1.1 The proposed Scheme has the potential to affect local air quality, both during construction and once the road is operational. This section provides an overview of the potential impacts of the proposed Scheme on air quality and describes the proposed assessment methodology for the ES.

Study Area

- 6.1.2 For the assessment of air quality, study areas will be defined on the basis of anticipated changes in traffic conditions (flow, speed and composition) as a result of the proposed Scheme i.e. Do-Something (DS), compared to road conditions without the proposed Scheme i.e. Do-Minimum (DM).
- 6.1.3 In the case of the local air quality assessment, the study area will be based on predicted changes to traffic conditions in the expected proposed Scheme opening year (2026). The assessment will be based on the opening year as this is expected to be the worst case year of operation. This is because the influence of improving vehicle exhaust emission standards is likely to be greater than any additional growth in traffic in subsequent operational assessment years¹.
- 6.1.4 The traffic change criteria set out in DMRB Air Quality guidance will be used to define the 'affected road network' (ARN) for the local air quality assessment. The DMRB local air quality traffic change criteria are as follows:
- a) road alignment will change by 5m or more, or;
 - b) daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more, or;
 - c) Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more, or;
 - d) daily average speed will change by 10km/h or more, or;
 - e) peak hour speed will change by 20km/h or more.
- 6.1.5 The local air quality study area will be defined, based on the above criteria, for those links within the ARN which have relevant receptors within 200m of either side of road carriageways (specified in DMRB HA207/07). All road links within 200m of these relevant receptors will then be included in the air quality assessment and this area forms the overall study area. A distance of 200m from roads is used because at these distances pollutant contributions from roads are difficult to distinguish from background pollutant concentrations.
- 6.1.6 In addition to the local air quality study area, the air quality assessment will also include a regional assessment of air quality and will report the findings of a

¹ The air quality modelling assumes that the vehicle fleet will become progressively 'cleaner' year-on-year as new technology is incorporated to reduce the harmful pollutants within vehicle exhaust emissions alongside commensurate improvements in background pollutant concentrations.

Transport Analysis Guidance (WebTAG) plan level appraisal. The WebTAG plan level appraisal and regional assessment are a reporting requirement of DMRB HA207/07.

- 6.1.7 The study area for the assessment of regional pollutant emissions will be defined using the regional air quality study area in DMRB HA207/07 (paragraph 3.20), as follows:
- a) Daily traffic flows will change by 10% AADT or more;
 - b) HDV flows will change by 10% AADT or more; and
 - c) Daily average speed will change by 20km/h or more.
- 6.1.8 The WebTAG plan level appraisal provides an overall measure of improvement or deterioration in air quality due to the proposed Scheme. The WebTAG plan level appraisal uses the same study area as the local air quality assessment described in paragraph 6.1.4.
- 6.1.9 The air quality assessment will also consider construction air quality impacts with a study area of 200m around the construction boundary and construction compounds.
- 6.1.10 In order to identify potential constraints, the study area for the assessment will be based on the extent of the identified ARN, with a buffer of 200m around this extent.

Planning Policy Context

- 6.1.11 The following planning policies are relevant to air quality:
- a) **National Policy Statement for National Networks** (NNNPS) designated January 2015); 5.6-5.9 and 5.14-5.15 (air quality); 5.84-5.85 and 5.89 (dust);
 - b) **National Planning Policy Framework** (NPPF) published March 2012 ; section 11, paragraphs 109, 120 and 124 (conserving and enhancing the natural environment); and
 - 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).
- 6.1.12 The Planning Policy and Guidance (PPG) provides a summary of the air quality issues set out in the NPPF. The assessment will include information on 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).

- 6.1.13 The assessment subsequently summarises the predicted changes in air pollution to ascertain whether the proposed 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 27), in line with the PPG. This means that the assessment is also in accordance with the NNNPS.
- 6.1.14 By taking account of mitigation measures in order to minimise the impact of the proposed Scheme on air quality, the assessment is in accordance with Wiltshire Council's Core Strategy. The assessment also takes into account the Local Plans of neighbouring authorities, including the South Somerset Local Plan (2006 – 2028) Policy EQ7, the Test Valley Borough Revised Local Plan DPD - 2011 – 2029 includes Policy E8, the North Dorset Local Plan Part 1 2011 -2031.

Defra National Air Quality Action Plan

- 6.1.15 In July 2017, The Department for Environment, Food and Rural Affairs (Defra) released the 'UK plan for tackling roadside nitrogen dioxide concentrations' (Ref 28). 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 proposed Scheme with EU Limit Values.

Baseline Conditions

- 6.1.16 Baseline air quality data for the area around the Scheme have been gathered from the following sources:
- a) boundaries of Air Quality Management Areas (AQMA's) (Ref 29).
 - b) Local Authority monitoring data (Ref 30 and Ref 31);
 - c) Highways England monitoring data (Ref 32);
 - d) Defra Pollution Climate Mapping (PCM) Model GIS data for the latest available year (Ref 33);
 - e) Defra air pollution background concentration maps (Ref 33);
 - f) locations of human health receptors (residential properties, schools, hospitals and elderly care homes) from Ordnance Survey (OS) base mapping (Ref 34); and
 - g) boundaries of relevant designated ecological sites (Ref 35).
- 6.1.17 There are no AQMA's within the proposed Scheme extents; the nearest AQMA is the Salisbury City Centre AQMA, approximately 7 miles (11.2km) south of the proposed Scheme. AQMA's potentially affected by the proposed Scheme will be identified, based on the modelling of traffic flows, and considered in the EIA, as appropriate.

- 6.1.18 Information on areas exceeding EU limit value thresholds is available from Defra's PCM Model. This model provides 'road contributed' concentrations of pollutants. Based on 2017 roadside NO₂ concentrations modelled by the Defra PCM model, no links exceeding 40µg/m³ are present within 6.2miles (10km) of the A303 Stonehenge in the scheme opening year (Ref 36).
- 6.1.19 Estimates of background pollutant concentrations in the UK are available for 0.6mile (1km) grid squares throughout the UK up to the year 2030, based on baseline data available for 2013. The projected 2016 background concentrations for NO₂ and PM₁₀ for the grid squares through which the proposed Scheme corridors would physically pass show that concentrations are all below the relevant air quality objectives.
- 6.1.20 A six month NO₂ diffusion tube survey was undertaken at locations in close proximity to the A303 Stonehenge between December 2015 and June 2016. The findings of this survey are presented in Table 6.1.

Table 6.1: Highways England Diffusion Tube Monitoring Results 2015-2016 (µg/m³)

Site ID	OS Grid Ref.		Site Name	Site Type	2015 Annual Average NO ₂ Concentration (µg/m ³) a,b
	X	Y			
SPAR_001	363096	126330	Chapel Cross Tearoom	Roadside	10.9
SPAR_002	360781	126516	Brains Lane	Roadside	9.6
SPAR_003	360913	126904	A359	Roadside	10.9
SPAR_004	360471	126423	High Street	Roadside	15.3
SPAR_005	358967	125551	Gason Hill	Roadside	16.1
SPAR_006	357851	125391	Stear Hill 1	Roadside	16.2
SPAR_007	357435	126624	Stear Hill 2	Roadside	6.3
SPAR_008	357724	125321	A303 West of Howell Hill	Roadside	21.0
SPAR_009	357074	125029	Plowage Lane	Roadside	23.4
SPAR_010	356760	124922	A303 Hawk House B&B	Roadside	24.3
SPAR_011	354621	125071	Church Street	Roadside	11.8
SPAR_012	354653	125228	Higher Farm Lane	Roadside	13.4
SPAR_013	354326	123937	Heathcote Road	Roadside	11.2
SPAR_014	352190	123964	Somerton Road	Roadside	17.0
SPAR_015	349768	120271	Queen Street	Roadside	11.2
AMES_001	415365	142157	Countess Rd	Roadside	17.5
AMES_002	416665	143663	Bulford High St	Roadside	16.4
AMES_003	417800	143035	A3028 Double Hedges	Roadside	8.4
AMES_004	418596	143452	Bulford Barracks	Roadside	15.0
AMES_005	418217	142290	A303 Jnc Allington Track	Roadside	18.5
AMES_006	416625	141621	Maple Way	Roadside	11.7
AMES_007	415976	142114	Ratfyn Road	Kerbside	11.5

Site ID	OS Grid Ref.		Site Name	Site Type	2015 Annual Average NO ₂ Concentration (µg/m ³) a,b
	X	Y			
AMES_008	415768	141602	Cold Harbour	Roadside	9.5
AMES_009	415285	141308	Church Lane	Kerbside	8.2
AMES_010	411797	141854	A303 Long Barrow	Roadside	18.7
AMES_011	412007	142368	Stonehenge	Roadside	8.9
AMES_012	409966	141347	A303/A360	Roadside	19.5
AMES_013	407625	141021	Brook Close	Kerbside	9.3
AMES_014	407661	140685	Church Street	Kerbside	6.9
AMES_015	407126	139279	Berwick St. James (1)	Roadside	6.3
AMES_016	407188	139548	Berwick St. James (2)	Roadside	7.2
AMES_017	406876	140830	A303 Parsonage Down	Roadside	20.1
AMES_018	401189	138335	A36	Roadside	21.4
AMES_019	400950	138400	Deptford	Roadside	13.4
AMES_020	399997	138534	Fisherton De La Mere	Roadside	9.9
AMES_021	400775	137712	Wyllye High Street	Kerbside	8.3
AMES_022	400916	137307	Dinton Road	Roadside	6.0
AMES_023	400410	137617	Dyer Lane	Kerbside	8.0
AMES_024	398147	134863	Cow Drove	Kerbside	4.9
AMES_025	394168	133978	Fonthill Bishop	Roadside	8.0
AMES_026	394898	134845	A303 East of Chicklade	Roadside	14.7
AMES_027	393362	134312	Chicklade Bottom Farm	Roadside	12.8
AMES_028	391251	134488	The Old Rectory Chicklade	Roadside	29.1
AMES_029	390996	134505	Seymour Farm Chicklade	Kerbside	19.7
AMES_030	391137	132973	East Street	Roadside	14.9
AMES_031	389941	134289	Knolly Down Farm	Roadside	15.2
AMES_032	388633	133237	B3089	Roadside	10.2
a Bias-adjustment factors of 0.94 and 0.85 were applied to the diffusion tubes beginning "SPAR" and "AEMS" respectively based on the results of triplicate co-location studies undertaken at the Charlton Mackrell and Bournemouth Porchester School AURN sites. b Seasonal adjustment factors of 0.88 and 0.91 were applied to the diffusion tubes beginning "SPAR" and "AMES" respectively based on the average ratio of the monitoring period mean and the 2015 annual mean at the Bournemouth, Charlton Mackrell, Reading New Town and Southampton Centre AURN sites.					

- 6.1.21 The results shown in Table 6.1 suggest that existing annual mean NO₂ 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 Air Quality Strategy (AQS) objective (40µg/m³) (Ref 142). This survey includes sites within the main proposed Scheme extent (the tunnel area) and within the Winterbourne Stoke bypass areas.
- 6.1.22 Continuous air quality monitoring and passive diffusion tube monitoring is ongoing in the areas administered by Wiltshire Council, South Somerset District Council and Test Valley Borough Council. Air quality monitoring data from these

sites collected between the years 2010 and 2015 are summarised below. No air quality monitoring has been undertaken within the area administered by North Dorset District Council since 2009.

- 6.1.23 There is a single diffusion tube located adjacent to the A303 within the area administered by Test Valley Borough Council, this site is located adjacent to an elevated section of the A303 and therefore is not representative of receptors adjacent to the A303. No monitoring is undertaken adjacent to the A303 or in close proximity to the proposed Scheme by Wiltshire Council, with the nearest monitoring being in Salisbury approximately 6.8 miles (11km) south of the proposed Scheme.
- 6.1.24 Passive diffusion tube data collected in the Wiltshire Council area show exceedances of the annual mean AQS objective for NO₂. This is not unexpected, as there are eight AQMAs for annual mean NO₂ in the Wiltshire Council area.
- 6.1.25 Key locations where exceedances of the annual mean AQS objective for NO₂ were measured in the wider area away from the scheme in 2015 include:
- adjacent to the A36 Wilton Road, A30 London Road, Castle Street, Southwestern Road, Minster Street and Exeter Street in Salisbury;
 - adjacent to the A363 in Bradford-on-Avon;
 - adjacent to the A361 in Devizes;
 - adjacent to the A436 in Marlborough;
 - adjacent to the A4 in Calne;
 - adjacent to the A4 in Chippenham;
 - adjacent to the A350 in Westbury;
 - adjacent to the A350 in Melksham; and
 - adjacent to the A3102 in Royal Wootton Bassett.
- 6.1.26 Approximately a third of the Wiltshire Council diffusion tube measurements in 2015 were above the annual mean AQS objective for NO₂, with exceedances primarily occurring adjacent to A-roads in urban areas. The highest NO₂ measurements within the assumed Stage 2 air quality study area in 2015, and in previous years, are summarised in Table 6.2.

Table 6.2: Highest Wiltshire Council Annual Mean Nitrogen Dioxide Diffusion Tube Monitoring Results (µg/m³)

Site ID	Site Name	Site Type	2010	2011	2012	2013	2014	2015
5	King George, 34 New Road	Roadside	60	54	59	60	54	52
47	17 Wilton Road	Roadside	63	64	62	62	56	39
84	9 Masons Lane	Roadside	70	74	71	76	57	64

Site ID	Site Name	Site Type	2010	2011	2012	2013	2014	2015
22	6 Herd Street	Roadside	52	59	63	64	54	53
<p>Exceedances of annual mean NO₂ UK AQS objective and EU limit value threshold (40 µg/m³) are highlighted in bold.</p> <p>Potential exceedances of hourly mean NO₂ UK AQS objective and EU limit value threshold (200 µg/m³, not to be exceeded more than 18 times a year) are underlined.</p> <p>Data for 2010 – 2014 taken from 2015 Updating and Screening Assessment for Wiltshire Council (Ref 37)</p> <p>Data for 2015 taken from Wiltshire Council 2016 Air Quality Annual Status Report (ASR) (Ref 30).</p> <p>Where diffusion tube monitoring results are available for 2016 these are still provisional and not yet ratified.</p>								

- 6.1.27 Concentrations of NO₂ measured in the neighbouring Test Valley Borough Council area in 2015, and in previous years, were all below the relevant UK AQS objective. The maximum measured annual mean NO₂ concentration in 2015 was 34 µg/m³ at the Palmerston Street, Romsey (west) site.
- 6.1.28 PM₁₀ concentrations were below relevant UK AQS objective at all monitoring locations in the air quality study area. The maximum measured annual mean PM₁₀ concentration and number of daily mean particulate matter (PM₁₀) concentrations greater than 50 µg/m³ in 2015, were 29 µg/m³ and 12 days respectively at the Masons Lane, Bradford on Avon continuous monitoring site. This reduced to an annual mean of 27 µg/m³ and a daily mean PM₁₀ concentration exceedance for eight days in 2016.
- 6.1.29 Considering the relevant pollutants and comparing these against AQS objectives for the areas considered at the scoping stage, the following is concluded:
- 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. It is therefore proposed that these pollutants will not be considered further as they are very unlikely to be present at levels which would represent potential significant impacts due to the proposed Scheme;
 - for PM₁₀, local authorities within the air quality study area have not identified a risk of exceedances for PM₁₀. Hence it is proposed that this pollutant is not considered likely to result in potential significant impacts due to the proposed Scheme; and
 - for the hourly mean NO₂ UK AQS objective, local authorities within the air quality study area have not identified a risk of exceedance, so it is not likely that there will be potential for significant impacts due to the proposed Scheme.
- 6.1.30 On this basis, it is considered that changes to the annual average NO₂ concentrations should be the main focus of the air quality assessment for public exposure (i.e. residential properties). Predicted changes to the concentrations of PM₁₀ will also be reported and discussed but in reduced level of detail compared to NO₂. Baseline conditions will be updated in the later stages of assessment to reflect the ARN and any updates to third party data sources (e.g. local authority monitoring).

6.1.31 Designated ecological sites in the air quality study area within SACs, Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and Ramsar sites, and which contain features which are sensitive to air pollutants, are summarised in Table 6.3. 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 have the potential to be exceeded at designated sites in the air quality study area but that the critical level for NO_x for the protection of vegetation (30µg/m³) is likely to be achieved at all sites, except for the River Avon System SSSI, Stockton Wood and Down SSSI and River Test SSSI.

Table 6.3: 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)	Max. NO _x concentration (µg/m ³)
Salisbury Plain SSSI / SPA / SAC	Sub-Atlantic semi-dry calcareous grassland	15	21.42	11.86
River Avon System SSSI / SAC	Broadleaved deciduous woodland	10	35.56	20.76
	Rich fens	15	21.7	20.76
	Low and medium altitude hay meadows	20	21.7	20.76
Lower Woodford Water Meadows SSSI	Low and medium altitude hay meadows	20	20.16	9.0
River Till SSSI	Site specific	Site specific	12.18	9.27
Steeple Langford Down SSSI	Sub-Atlantic semi-dry calcareous grassland	15	19.74	8.87
Parsonage Down SSSI	Sub-Atlantic semi-dry calcareous grassland	15	19.46	9.07
Yarnbury Castle SSSI	Sub-Atlantic semi-dry calcareous grassland	15	19.18	8.42
Stockton Wood and Down SSSI	Broadleaved deciduous woodland	10	30.8	8.66
	Sub-Atlantic semi-dry calcareous grassland	15	19.32	8.66
Whitesheet Hill SSSI	Non-Mediterranean dry acid and neutral closed grassland	10	23.38	8.09
	Sub-Atlantic semi-dry calcareous grassland	15	23.38	8.09
	Low and medium altitude hay meadows	20	23.38	8.09
River Test SSSI	Broadleaved deciduous woodland	10	42.42	23.68
	Rich fens	15	25.2	23.68
	Low and medium altitude hay meadows	20	25.2	23.68

Designated site	Relevant nitrogen critical load class	Critical load (kg N/ha/yr) ^a	Max. nitrogen deposition (kg N/ha/yr)	Max. NO _x concentration (µg/m ³)
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/)				
^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 2012-14.				

Potential Impacts and Mitigation

- 6.1.32 The proposed Scheme has the potential to affect local air quality, both during construction and once in operation, in the following ways:
- there could be increased emissions of dust during construction of the proposed Scheme from dust-raising activities on site;
 - there will be emissions associated with non-road mobile machinery (NRMM) undertaking construction works;
 - 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;
 - once operational, air quality could be affected (positively or negatively) by changes in vehicle activity (flows, speeds and composition) as a result of the proposed Scheme; and
 - air quality could also be affected by any changes in the distances between sources of emissions and air quality sensitive receptors. The proposed Scheme tunnelled extent would enclose a section of the A303 but would result in emissions from tunnel operations.
- 6.1.33 There is some potential for adverse effects during the construction of the proposed Scheme in relation to construction dust and 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 Stones at the Stonehenge monument which may be particularly sensitive to such dust (Ref 38). The need for any additional mitigation measures will be identified in addition to standard dust mitigation measures as part of the assessment.
- 6.1.34 On the basis of the available information including existing monitored levels in the wider study area, exceedances of the annual mean NO₂ UK AQS objective have the potential to occur in urban areas within the area administered by Wiltshire Council.

- 6.1.35 Operational impacts on air quality may be difficult to avoid, but in some circumstances it is possible to reduce 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.

Assessment Methodology

- 6.1.36 Potential impacts on local air quality resulting from both the construction and operation of the proposed Scheme will be assessed following the principles in relevant guidance outlined in DMRB HA207/07, associated Interim Advice Notes (IANs), Major Project instructions (MPI) and Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16)) listed below:
- a) HA207/07 Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1, May 2007;
 - b) IAN 170/12 v3 Updated air quality advice on the assessment of future NO_x and NO₂ projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality';
 - c) IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07);
 - d) IAN 175/13 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);
 - e) IAN 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality and Volume 11, Section 3;
 - f) MPI-28-082014: Highways England Major Projects' Instructions – Determining the correct base year traffic model to support air quality assessments (Ref 39); and
 - g) Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16)), where appropriate (Ref 40).

Air Quality Criteria

- 6.1.37 For NO₂ and PM₁₀, there are two sets of ambient air quality criteria for the protection of public health, namely those set by the EU and transposed in to UK law by The Air Quality Standards Regulations 2010 (Ref 41) and those implementing the UK National AQS.
- 6.1.38 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 30).
- 6.1.39 The standards set by the EU are legally binding, mandatory limit values (LV) requiring national government compliance at the agglomeration scale.

- 6.1.40 Local air quality criteria relevant to the air quality assessment for the proposed Scheme are summarised in Table 6.4.

Table 6.4: Relevant Air Quality Criteria (Human Health)

Pollutant	Criteria	Compliance Date	
		AQS Objective	EU Limit Value
NO ₂	Hourly average concentration should not exceed 200µg/m ³ more than 18 times a year	31 December 2005	1 January 2010
	Annual mean concentration should not exceed 40µg/m ³	31 December 2005	1 January 2010
PM ₁₀	24 hour concentration should not exceed 50µg/m ³ more than 35 times a year	31 December 2005	1 January 2010
	Annual mean concentration should not exceed 40µg/m ³	31 December 2005	1 January 2010

- 6.1.41 The EU has set a limit value for the protection of vegetation for NO_x based on the work of the United Nations Economic Commission for Europe (UNECE) and World Health Organisation (WHO). The limit value for the protection of vegetation is an annual mean oxides of nitrogen concentration of 30µg/m³ and is included in SI 2010 No. 10012 (Ref 133). The limit value for the protection of vegetation applies in locations more than 12.4miles (20km) from towns with more than 250,000 inhabitants or more than 3.1miles (5km) from other built-up areas, industrial installations or motorways.
- 6.1.42 As the UNECE and the WHO have set a critical level for NO_x for the protection of vegetation, the Statutory Nature Conservation Agencies' (in England, Natural England) policy is to apply the criteria on a precautionary basis, as a benchmark, in internationally designated conservation sites (Ramsar, SACs, SPAs and SSSIs).
- 6.1.43 In addition, critical loads for nitrogen and acid deposition have been set that represent (according to current knowledge) the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem.
- 6.1.44 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 for each designated site with the potential to be affected by each proposed Scheme following consultation with project ecologists and Natural England.

Receptors

- 6.1.45 Receptors that are potentially sensitive to changes in air quality are defined in DMRB HA207/07 as housing, schools, hospitals and designated species and/or habitats within a relevant designated ecological site located within 200m of those roads or construction sites which will be affected by the proposed Scheme.
- 6.1.46 Information on sensitive receptors in the study area will be gathered from the following sources:

- a) locations of human health receptors (residential properties, schools, hospitals and elderly care homes) from OS base mapping; and
- b) boundaries of relevant designated ecological sites.

- 6.1.47 The air quality assessment will consider the proposed Scheme impacts at representative sensitive human health receptors (e.g. housing, schools and hospitals) where these are located within 200m of the ARN and the proposed Scheme route alignment. The focus of this assessment will be the change in exposure of the inhabitants of these properties to concentrations of NO₂.
- 6.1.48 Proposed Scheme impacts will also be considered at receptors representing designated ecological sites where these are located within 200m of the ARN of the proposed Scheme. The focus of this assessment will be the change in annual mean NO_x concentrations and rates of nitrogen deposition affecting sensitive ecosystems.
- 6.1.49 Whilst not being a designated ecological site (as defined within DMRB HA207/07), should tunnel portals and/or affected roads be located within 200m of Stonehenge itself, the change in annual mean NO_x concentration and rates of nitrogen deposition, which would potentially affect the unique assemblages of lichen at Stonehenge that add to the character of the WHS, will also be considered.

Construction Impacts

- 6.1.50 Construction impacts will be assessed qualitatively, taking into account the nature of any proposed construction activities that have the potential to generate dust and the location of any sensitive receptors situated within 200m of the proposed Scheme construction works. Suitable mitigation measures to control/minimise construction dust emissions and NRMM plant emissions will be recommended.
- 6.1.51 The level of any construction traffic air quality assessment will depend upon the information available on traffic management and construction vehicles available during the EIA together with the risk of likely significant temporary air quality impacts.

Operational Impacts – Local Air Quality Assessment

- 6.1.52 Operational impacts will be assessed using an updated traffic model and where relevant further developed proposed Scheme design details. The local air quality methodology for the ES will be based on a detailed level of air quality assessment.
- 6.1.53 The simple assessment method is not proposed. Earlier air quality work for the proposed Scheme has not suggested a risk of significant air quality impacts at locations with exceedances of AQS objectives. There are likely to be locations which will be better described using a detailed air quality modelling approach. This includes locations of congestion and this approach will allow seasonal variations in traffic during periods of increased traffic flows within the study area (e.g. summer periods) to be captured if required.

- 6.1.54 Based on the preliminary design and findings and the distances of sensitive receptors from tunnel portals it is not considered to be necessary to undertake dispersion modelling of the proposed Scheme tunnel portals.
- 6.1.55 Assessment of operational impacts adjacent to the ARN will be undertaken in accordance with DMRB HA207/07 (and associated IANs) using the latest version of the ADMS Roads to determine the impact of the proposed Scheme at identified representative sensitive receptor locations.
- 6.1.56 The key scenarios to be considered for local air quality are:
- a) The existing base situation which, based on guidance given in MPI-28-082014, is the year 2016 for air quality;
 - b) Do-Minimum and Do-Something for the proposed Scheme in the first full year of opening (expected to be the year 2026).
- 6.1.57 Road sources included in the traffic model will be explicitly modelled using ADMS-Roads. The model requires input of traffic flow, composition and speed data as well as the road width and type and hourly sequential meteorological data.
- 6.1.58 Traffic data can be input to ADMS-Roads for AM, Inter Peak (IP), PM and off peak period. Period flows will be used where possible and the following parameters adopted:
- a) Composition will be input in terms of a percentage of HDV;
 - b) speeds are input as a speed category. This category will be determined in accordance with IAN 185/15 on speed banding;
 - c) corresponding NO_x and PM₁₀ rates based on the speed category will be used; and
 - d) road to receptor distances will be determined in GIS software.
- 6.1.59 Representative sensitive receptors will be selected for assessment within the local air quality ARN. These will generally include those sensitive receptors placed closest to the ARN.
- 6.1.60 Local air quality modelling predictions using the ADMS-Roads will provide estimates of the contribution from road traffic emissions to annual mean concentrations of nitrogen oxides (NO_x) at discrete receptors; these concentrations will be combined with estimates of background concentrations, to derive totals for annual mean NO₂. NO_x to NO₂ conversion will be carried out using the Defra NO_x to NO₂ tool (Ref 6-32).
- 6.1.61 Base year (2016) modelled estimates will be verified, with comparison against available ratified monitoring data wherever possible and with reference to Defra's Technical Guidance LAQM.TG(16). Where systematic bias is clearly evident in the base year verification, adjustment will be applied to bring modelled concentrations more into line with monitored concentrations.

- 6.1.62 A key element of the local air quality impact assessment is the rate of improvement in air quality over time as cleaner vehicles enter the national vehicle fleet. The methodology outlined within IAN 170/12 v3 on the assessment of future NO_x and NO₂ projections will be used in this assessment. The method considers Defra's advice on long term trends related to roadside NO₂ concentrations, which suggests that there is a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends.
- 6.1.63 The methodology, known as 'Gap Analysis', involves the completion of air quality modelling and verification to correct verified modelled total NO₂ concentrations. Following verification of the modelled results, the predictions are then adjusted to represent the observed long term trend. The adjusted results from this Gap Analysis will be presented.
- 6.1.64 Previous air quality assessments have suggested that the projection factors presented in IAN 170/12 rather than the Long Term Trend E6 (LTTE6) factors were most appropriate for the air quality assessment for the proposed Scheme. This is because the previous assessment demonstrated that monitoring data trend analysis justifies the selection of the IAN 170/12 projections over other options. However, additional LTTE6 gap analysis will also be presented in the air quality assessment because the proposed Scheme opening is still a further seven years into the future. By this time further improvements would be expected in air quality beyond those described by the trend analysis previously undertaken on recent years of data.
- 6.1.65 An evaluation of the significance of the local air quality assessment findings at sensitive receptors for health and designated ecological sites will be undertaken in accordance with Highways England guidance IAN 174/13. This guidance evaluates the significance of air quality impacts using the total estimated pollutant concentrations at sensitive receptors and the magnitude of change estimated to occur as a result of the proposed Scheme, and recommends that the following key criteria for air quality are considered.
- 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?
- 6.1.66 Following the collation of information to address these questions, an informed professional judgement on the significance of local air quality impacts for public exposure and designated ecological sites will be established. Of the above questions, 'will many people be affected?' will be addressed in terms of the

number of receptors predicted to have small, medium and large changes in air quality. The change focuses only on those receptors that exceed the air quality objective and in cases where the numbers of affected properties are above the upper thresholds listed in IAN 174/13, which may suggest likely significant air quality impacts.

- 6.1.67 The significance of the effects on European and nationally designated habitat sites, including the magnitude of change in NO_x and / or nitrogen deposition, will be considered as part of the Biodiversity assessment (see Section 6.4).
- 6.1.68 The predicted air quality impacts of the proposed Scheme will also be evaluated against relevant national, regional and local air quality planning policy.

Operational Impacts – Local Air Quality Compliance Risk Assessment

- 6.1.69 A compliance risk assessment for the proposed Scheme against the EU Directive in accordance with IAN 175/13 will be provided in the air quality assessment. This assessment enables proposed Scheme assessors to undertake and report on the risk of a proposed Scheme being non-compliant with the EU Directive. The compliance risk assessment is undertaken using the results of the local air quality assessment and the PCM Model. The overall evaluation of significance will also include information on compliance risks in relation to the Directive.

Operational Impacts – WebTAG Plan Level Local Air Quality Assessment

- 6.1.70 The local plan level methodology within the WebTAG guidance aims to quantify the change in exposure at receptors in the opening year as a result of proposed Schemes, through the quantification of exposure for all DMRB local affected roads. The methodology follows a number of steps comprising:
- a) Identification of the affected road network, which is the same as the DMRB local air quality affected road network;
 - b) Quantification of the number of properties within 0 – 50m, 50 – 100m, 100 – 150m and 150 – 200m bands, from the affected roads;
 - c) The calculation of concentrations within each band at 20m, 70m, 115m and 175m from the road centreline using the DMRB spreadsheet model;
 - d) Calculation of property-weighted NO₂ and PM₁₀ concentrations;
 - e) Calculation of the total numbers of properties where air quality improves, worsens or stays the same for each pollutant; and
 - f) Calculation of an overall assessment score for NO₂ and PM₁₀.
- 6.1.71 An overall positive score indicates an overall worsening in air quality, and an overall negative score indicates an overall improvement in air quality.
- 6.1.72 The WebTAG plan level appraisal is a reporting requirement of DMRB. WebTAG plan level appraisal outcomes do not have defined significance criteria but will be presented and described to inform the assessment of overall change.

Operational Impacts – Regional Air Quality Assessment

- 6.1.73 An assessment of regional emissions of NO_x, PM₁₀ and carbon dioxide will be undertaken in accordance with DMRB HA207/07 using vehicle emission factors implemented in Defra's Emission Factor Toolkit (EFT) (Ref 130). The key scenarios to be modelled are:
- a) the existing base situation (2016);
 - b) Do-Minimum and Do-Something for the proposed Scheme in the first full year of opening (expected to be 2026); and
 - c) Do-Minimum and Do-Something for the proposed Scheme in a future year (expected to be 2041).
- 6.1.74 The results of the regional assessment (annual emissions, change in emissions with the proposed Scheme and distance travelled) will be presented in tabular format, together with interpretive text.
- 6.1.75 The regional assessment is a reporting requirement of DMRB. The regional assessment outcomes do not have defined significance criteria but will be presented and described to inform the assessment of overall change.

Assumptions, Limitations and Uncertainties

- 6.1.76 The scope of the proposed air quality assessment has been informed by the most recent information available at the time of writing. Monitoring data have been obtained from local authorities and previous proposed Scheme-specific studies. The local operational air quality assessment will use a comprehensive traffic dataset, the latest Defra local air quality management tools and guidance, Highways England tools and guidance, a detailed air quality model (ADMS-Roads) and predictions will be checked against the most recently available local air quality monitoring data. This approach will minimise the assumptions and limitations of the local operational air quality assessment as far as practicable.

6.2 Cultural Heritage

Introduction

- 6.2.1 This section sets out the approach to the assessment of the Scheme's impacts on cultural heritage (comprising built heritage, archaeology and the historic landscape). The purpose of the assessment will be to identify and characterise any relevant cultural heritage resources, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.
- 6.2.2 A separate Heritage Impact Assessment (HIA) scoping report, in accordance with ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, January 2011 (Ref 52), is also being issued to specifically address the scope of works for the Heritage Impact Assessment on the Outstanding Universal Value (OUV) of the Stonehenge, Avebury and Associated Sites World Heritage Site (WHS). The results of the HIA will be incorporated into the final Environmental Statement and Cultural Heritage chapter, and the HIA report will be included as an Appendix to it.

- 6.2.3 The current A303 has a major negative impact on the WHS in terms of its connectivity (north and south across the existing A303), traffic problems, visual intrusion, noise, and air quality. The relationship of the proposed Scheme to cultural heritage, and its potential benefits and impacts, has been a critical factor in the route selection process.
- 6.2.4 The central part of the proposed Scheme lies within the WHS, with its wealth of upstanding and buried prehistoric remains dating from the Neolithic to the Bronze Age. Outside the WHS further extensive heritage assets are recorded. Along the full length of the proposed Scheme heritage assets date from the Mesolithic through to the modern period.

Study Area

- 6.2.5 The study area for cultural heritage assets will extend to a distance of 500m from the proposed draft DCO site boundary. A flexible approach will be taken to the identification of high-value assets on which there may be an impact upon setting, up to 2km beyond the proposed draft DCO site boundary. This will be guided by the Scheme's Zone of Theoretical Visibility (ZTV), but will also consider physical and historical connectivity and relationships, changes to noise levels, air quality and traffic.
- 6.2.6 The study area will include sections of the current A303 within the WHS and outside the WHS which will be de-trunked and/or decommissioned, or downgraded as part of the proposed Scheme.

Planning Policy Context

- 6.2.7 Legislation and planning policy relating to cultural heritage and pertinent to this project comprises:

Legislation:

- Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the 'APFP Regs 2009') (Ref 117)
- Planning Act 2008 (as amended by the Localism Act 2011) (the '2008 Act') (Ref 118),
- Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 2)
- Ancient Monuments and Archaeological Areas Act 1979 (Ref 43) (amended by the National Heritage Act 1983 (Ref 44) and 2002 (Ref 45)) and the Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 46) (excluding normal planning procedures which are disapplied by the Development Consent Order (DCO) which if granted, would encompass all of the normal consents).

National Planning Policy:

- NNNPS (Ref 17) with particular reference to paragraphs 5.122 to 5.137, and
- NPPF (Ref 8) – with particular reference to Section 12 Conserving and Enhancing the Historic Environment.

National Guidance:

- National Planning Practice Guidance, DCLG, (Ref 103)

- Historic Environment Good Practice Advice in Planning Note 2. Managing Significance in Decision Taking in the Historic Environment. Historic England (Ref 47),
- Historic Environment Good Practice Advice in Planning Note 3. The Setting of Heritage Assets. Historic England (Ref 48), and
- Historic England guidance *Seeing the History in the View* 2011 (Ref 131).

Local Plan Policy:

- Wiltshire Core Strategy (adopted 2015) (Ref 49), with particular reference to Core Policy 58 (Ensuring the conservation of the historic environment) and Core Policy 59 (The Stonehenge, Avebury and Associated Sites World Heritage Site and its setting), and
- Wiltshire Local Transport Plan 2011- 2026 (Ref 120).

WHS Management Plan:

- Stonehenge, Avebury and Associated Sites World Heritage Site Management Plan 2015 (Ref 50).

Baseline Conditions

- 6.2.8 The following section provides an overview of the cultural heritage baseline within the study area, see Figure 6.1. It is noted that many Scheduled Monuments and some non-designated archaeological sites noted on the Wiltshire and Swindon Historic Environment Record are complex and include multiple facets or elements (e.g. National Heritage List for England (NHLE) reference number (No.) 1010140 – described as ‘Stonehenge, the Avenue, and three barrows adjacent to the Avenue forming part of a round barrow cemetery on Countess Farm’), or can be very extensive in their geographical coverage, such as ‘field systems’.

Stonehenge, Avebury and Associated Sites World Heritage Site:

- 6.2.9 The Stonehenge, Avebury and Associated Sites World Heritage Site (WHS) consists of two separate parts, one part focussed on Avebury to the north and the second on Stonehenge to the south. The Proposed Scheme passes through the Stonehenge element of the WHS between Longbarrow Crossroads, Winterbourne Stoke and Countess Roundabout, Amesbury. Within the WHS a tunnel will be constructed of at least 2.9km in length. The eastern tunnel portal approach will largely use existing dual carriageway within the WHS. The western approach will involve the construction of new dual carriageway just south of the existing A303 within the WHS. The proposed Scheme will be designed to minimise impacts on the OUV of the WHS. Beyond the WHS, the Scheme extends 1km to the east and 6.2km to the west.

Scheduled Monuments:

- 6.2.10 There are 285 Scheduled Monuments within the 2km study area. Of these, 175 are within the WHS boundary.

Listed Buildings:

- 6.2.11 There are 29 Grade I and II* listed buildings within the 2km study area, of which 7 are Grade I and 22 are Grade II* listed, including, but not limited to, West Amesbury House, Amesbury Abbey (listed at Grade I and other Grade II* listed

buildings within the Abbey grounds), the church of St Leonards and St Mellor, Amesbury, the Church of St Leonard, Bulford, the Manor House, Winterbourne Stoke and Buildings 455 and 456 (Five Aircraft Hangars), Durrington Camp.

- 6.2.12 There are 98 Grade II listed buildings within the 500m study area. Many of these are associated with historic villages such as Winterbourne Stoke and Bulford, or are situated in the town of Amesbury. There are also a number of listed milestones on modern roads, that had their origins as historic turnpikes, and several listed buildings associated with the use of the site by the military (such as several Grade II listed buildings situated in Larkhill).

Registered Parks and Gardens:

- 6.2.13 There is one Registered Park and Garden within the 2km study area: Amesbury Abbey (Grade II*).

Conservation Areas:

- 6.2.14 Within the 500m study area there are five Conservation Areas. These are Amesbury Town Centre, West Amesbury, Bulford, Durrington and Winterbourne Stoke Conservation Areas.

Non-designated assets:

- 6.2.15 There are a large number of non-designated heritage assets within the study area. The existing data will be refined as part of the PEI Report and as part of establishing the cultural heritage baseline for the ES.
- 6.2.16 A minority of these heritage assets are non-designated historic buildings, but most are archaeological in character, including upstanding monuments and buried archaeological remains. They include settlements, barrows, field systems, hillforts and water meadows, and span from the Mesolithic period through to the modern era.

Potential Impacts and Mitigation

- 6.2.17 The proposed Scheme crosses a landscape rich in known archaeology. The Scheme will affect this landscape both positively and negatively, with some assets subject to beneficial and adverse impacts.
- 6.2.18 The principal beneficial effect of the proposed Scheme relates to the permanent removal of existing road infrastructure from the central section of the Stonehenge part of the WHS. This has huge potential to reconnect the Stonehenge landscape and improve the setting of key designated and non-designated heritage assets.
- 6.2.19 Construction of the proposed Scheme has the potential to affect heritage assets in the following ways:
- a) Partial or total removal of heritage assets;
 - b) Compaction of archaeological deposits by construction traffic and structures;
 - c) Both beneficial and adverse effects on the setting of heritage assets including changes to visual intrusion, noise, air quality, severance, access

and amenity as a result of the realignment of the A303, undergrounding of the road and other construction works.

- 6.2.20 Operation of the proposed Scheme has the potential to result in impacts on the setting of heritage assets. In the majority of cases, these would be long-term in nature. These impacts would commence during construction of the scheme and continue during operation; however the degree of impact may vary between phases. Such impacts could include:
- a) Both beneficial and adverse changes to the surroundings of certain heritage assets or the general character of their setting; and
 - b) Changes to access to, or the management or viability of, heritage assets.
- 6.2.21 Mitigation will be inbuilt to the design of the proposed Scheme to minimise impacts to heritage assets and their setting as far as possible. An appropriate archaeological mitigation strategy, for the identified impacts from construction and operation upon heritage assets, will be agreed with the Heritage Monitoring and Advisory Group (HMAG) comprising Historic England, the National Trust, Wiltshire Council Archaeology Service and the English Heritage Trust and the Scientific Committee.

Assessment Methodology

Scope and level of assessment:

- 6.2.22 The above discussion establishes that: a) the proposed Scheme passes through a landscape of high cultural heritage value and sensitivity; and b) that there is the potential for significant effects on heritage assets (both beneficial and adverse) from the construction and operation of the proposed Scheme.
- 6.2.23 Given the importance of the heritage assets potentially affected by the proposed Scheme, there is a requirement for a Detailed Assessment of cultural heritage as part of the EIA (as stipulated by DMRB Volume 11, Section 3, Part 2 (HA208/07), para. 3.9) (Ref 51).
- 6.2.24 No elements of the cultural heritage (including archaeological remains, historic buildings and historic landscape, as defined in DMRB Volume 11, Section 3, Part 2 (HA208/07), paras. 2.3-2.6), have been scoped out from the EIA.
- 6.2.25 In addition to the detailed assessment of impacts as required by DMRB, there will be a separate Heritage Impact Assessment (HIA) assessing impacts on the OUV of the World Heritage Site, in accordance with the procedures set out in the Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (ICOMOS 2011) (Ref 52). The HIA will inform and be informed by the DMRB detailed assessment. The HIA report will be included as an appendix to the Environmental Statement and the results will be incorporated in the ES discussion and conclusions.

Assessment standards:

- 6.2.26 The DMRB detailed assessment will accord with the guidance contained in DMRB Volume 11 Section 3 Part 2 (HA208/07), will be prepared in line with national and local planning policy, national guidance and with the Chartered Institute for

Archaeologists' (ClfA) Code of Conduct (Ref 53) and the ClfA Standard and Guidance for historic environment desk-based assessment (Ref 54).

Assessment of Significance (or Value):

- 6.2.27 An assessment of the known and potential buried archaeological resource and historic landscape character and features will be undertaken. It will be prepared in accordance with principles set out in the National Planning Policy Framework 2012 (NPPF) and advice provided in National Planning Practice Guidance and Historic England's good practice advice (GPA) guide GPA2: Managing Significance in Decision Taking (Ref 47).
- 6.2.28 Significance (or value – see paragraphs 6.2.31 and 6.2.32 below) is defined within the NNNPS as the sum of the heritage interests that a heritage asset holds. Designated assets are those that have been recognised as being of higher significance and worthy of protection. However, it should not be assumed that all non-designated assets are of a lower significance as they may not have been the subject of any previous investigation or assessment and further research may indicate that they merit designation/statutory protection.
- 6.2.29 The assessment of the significance (or value) of heritage assets will include a consideration of their archaeological, historic, architectural and artistic interests and the extent to which that significance relates to different elements of the asset and to what extent the setting of a heritage asset adds to or detracts from its significance.
- 6.2.30 The assessment will include, where appropriate, assessment of any evidence for the potential reduction of significance (or value) due to changes in condition, such as the truncation or the erosion of archaeological deposits, alterations to buildings, or severance or removal of historic landscape features etc.
- 6.2.31 DMRB Volume 11.3.2 Annex 6 Historic Buildings, Annex 5 Archaeological Remains and Annex 7 Historic Landscape set out guidance on the criteria used for establishing the value of heritage assets comprising historic buildings, archaeological remains and historic landscape features. The criteria have been combined and each heritage asset has been assigned a 'value' as indicated in Table 6.5.
- 6.2.32 The 'value' of a structure, area, site or landscape reflects its significance as a heritage asset and, therefore, its sensitivity to change. For the purposes of this assessment, 'value' equates to the term 'significance' as defined in Annex 2 of the NPPF.

Table 6.5: Guide for Assessing the Value of Historic Building Assets, Archaeology and Historic Landscape (HA 208/2007)

ASSET VALUE	DESCRIPTION
Very High	<p>Assets inscribed as being of universal international importance, such as World Heritage Sites</p> <p>Assets that contribute significantly to acknowledged international research objectives</p> <p>Buildings of recognised international importance</p> <p>Historic landscapes of international value, whether designated or not</p> <p>Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s)</p>
High	<p>Scheduled Monuments with extant remains, or sites and remains of comparable quality</p> <p>Assets that contribute significantly to acknowledged national research objectives</p> <p>Grade I and Grade II* Listed Buildings</p> <p>Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in their listing grade, including non-designated structures of clear national importance</p> <p>Conservation areas containing very important buildings</p> <p>Designated and non-designated historic landscapes of outstanding interest of high quality and importance, and of demonstrable national value</p>
Medium	<p>Designated or undesignated assets that contribute to regional research objectives</p> <p>Grade II Listed Buildings</p> <p>Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical association</p> <p>Conservation areas containing important buildings</p> <p>Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)</p> <p>Designated special historic landscapes and non-designated landscapes that would justify special historic landscape designation, landscapes of regional value</p>
Low	<p>Sites of low importance</p> <p>Assets compromised by poor preservation and/ or poor survival of contextual associations</p> <p>Locally listed buildings</p> <p>Historic (unlisted) buildings of modest quality in their fabric or historical association</p> <p>Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)</p> <p>Undesignated historic landscapes</p> <p>Historic landscapes with importance to local interest group</p>
Negligible	<p>Assets with very little or no surviving archaeological interest</p> <p>Buildings of no architectural or historical note; buildings of an intrusive character</p> <p>Landscapes with little or no significant historical interest</p>
Unknown	Assets the importance of which has not been ascertained

Assessment of the setting and sensitivity of heritage assets:

- 6.2.33 The assessment of heritage assets in the EIA, which is guided by the recommendations outlined in The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Ref 47).
- 6.2.34 The assessment of the setting of heritage assets for EIA will be undertaken in accordance with principles set out in the National Planning Policy Framework 2012 (NPPF) and advice provided in National Planning Practice Guidance and Historic England's good practice advice (GPA) guide GPA3: The Setting of Heritage Assets (Ref 48).
- 6.2.35 GPA3 has been specifically written to address the complexities associated with making decisions associated with the setting of heritage assets. The document describes the key terms of curtilage, character and context and explains the extent of setting and that it is not fixed and changes depending on the asset. The document also highlights the importance of views to the understanding of setting and states which views could contribute to understanding the significance (or value) of a heritage asset. It then offers a staged approach to proportionate decision-taking.
- 6.2.36 The contribution of setting to the significance (or value) of an asset is often expressed by reference to views and the GPA3 in paragraph 6 identifies those views, such as views that were designed or those that were intended, that contribute to understanding the significance of assets. An approach to the assessment of heritage significance within views is provided in the Historic England guidance *Seeing the History in the View* (Ref 131). Although views of or from an asset will play an important part, the way in which an asset is experienced in its setting is also influenced by other environmental factors such as noise, dust and vibration from other land uses in the vicinity, and by our understanding of the historic relationship between places.
- 6.2.37 In the broadest terms, the setting of a heritage asset comprises of the objects and conditions around it, and within which it is perceived and experienced; and in this sense all heritage assets have settings. Not all settings, however, make a positive or negative contribution to the significance (or value) of the assets they encompass.
- 6.2.38 The setting will be a combination of views, other historic features and their relationships to the asset, ambience (topography, vegetation, noise, and other sensory experiences such as smell and vibration) and context (what is known or thought about the asset, but not immediately experienced through the senses).
- 6.2.39 A baseline setting assessment will be prepared for identified heritage assets that will be made with reference to both visual and non-visual impacts, including aural (noise) impacts and sensory experiences such as smell and vibration.
- 6.2.40 In order to facilitate the selection of heritage assets where visual aspects of setting are potentially affected, the ZTV model will be used as a guide, but consideration will also be given to physical and historical connectivity and relationships.

- 6.2.41 Assessment of aural impacts will draw upon any noise contour or assessment data provided by the Noise and Vibration Team during the EIA.
- 6.2.42 All heritage assets identified by the data searches (see below), within the confines of the proposed study area, will be compiled into an inventory/database and accurately located in relation to the proposed Scheme on a map at an appropriate scale.
- 6.2.43 Key view points within the WHS Area will also be considered and will be agreed with the landscape and visual impact assessment team, and HMAG. The identification of view points and the methodology for assessment is described in Section 6.3.
- 6.2.44 A fully illustrated DMRB detailed assessment baseline will be prepared. It will identify all designated or non-designated heritage assets within the defined study area. This will involve the collation of information from the data gathering exercise, alongside a map regression and walkover survey.
- 6.2.45 The known archaeological and heritage assets will be visited to record their survival, extent, condition, setting and value and confirm their location and relationships to other heritage assets, alongside the identification of any previously unrecorded assets. Land access agreement will be sought from the landowner for site access, should this not be possible, heritage assets will be viewed from nearby public rights of way or accessible vantage points. The site's ground conditions and evidence for previous disturbance, where this is relevant, will also be assessed utilising available geotechnical investigation reports and previous, ongoing and proposed archaeological evaluation. The results will be incorporated within the cultural heritage baseline and an assessment of the likely survival of archaeological remains will be made.
- 6.2.46 Consultation will be undertaken with the Wiltshire Council Conservation Officers, Wiltshire Council Archaeology Service and Historic England outside the WHS, and HMAG and the Wiltshire Council Conservation Officers within the WHS, with regards to the results of the DMRB detailed assessment baseline and the likely impacts on heritage assets from the construction and operation of the Scheme. Mitigation measures will be agreed as necessary and appropriate.

Assessment of the impacts, mitigation measures and significance of effects

- 6.2.47 Following the DMRB detailed assessment, the potential impacts of the proposed Scheme on the value and setting of the identified heritage assets will be assessed and reported within the ES. This assessment will involve establishing the value of the heritage asset and the magnitude of the impact upon it. The potential resultant effects of the proposed Scheme on the heritage asset will be assessed on the basis of their type (direct, indirect, and cumulative), nature (beneficial, neutral or adverse) and longevity (reversible, short-term or long-term; irreversible, permanent). The assessment will take into account the value of the heritage asset and the magnitude of impact.
- 6.2.48 Mitigation measures designed to prevent, reduce or offset adverse effects will be proposed, and the significance of effects will be assessed taking into account the likely effectiveness of the mitigation proposed.

- 6.2.49 The cultural heritage impact assessment will be undertaken following the guidance in DMRB Volume 11, Section 3, Part 2 (HA 2007) including the method for the establishment of the significance (or value) of the heritage resource, the method for understanding the level of impact upon the resource and the method for understanding the resultant significance of effects. Mitigation measures will be put forward as set out in DMRB Volume 10, Section 6, Part 1 (HA 2001) (Ref 55).

Desk-based sources:

- 6.2.50 Sources of information that will be consulted include, but not be limited to:

- a) The NHLE;
- b) Wiltshire and Swindon Historic Environment Record (WSHER), including the Wiltshire Historic Landscape Characterisation (HLC);
- c) National Mapping Programme (NMP) and other aerial photographic sources as relevant;
- d) Cartographic sources;
- e) Relevant primary and secondary sources;
- f) Results from major research projects within the Stonehenge landscape (subject to availability): including (but not limited to) the Stonehenge Hidden Landscapes Project (Ref 56); Stonehenge Riverside Project (Ref 57); and recent Historic England research;
- g) Published and unpublished reports from archaeological investigations;
- h) Stonehenge, Avebury and Associated Sites World Heritage Site Research Framework (Ref 58);
- i) South West Archaeological Research Framework (Ref 59); and
- j) Stonehenge, Avebury and Associated Sites World Heritage Site Management Plan 2015 (Ref 50).

Field Investigation:

- 6.2.51 Field investigation will be undertaken to refine and augment the desk-based data (see sections 6.2.41-43 below). In outline, its components will comprise:

- a) Field walkover survey;
- b) Field walking (i.e. systematic surface survey);
- c) Geophysical survey;
- d) Archaeological evaluation;
- e) Archaeological monitoring of geotechnical investigations; and
- f) Geoarchaeological and palaeo-environmental assessment.

- 6.2.52 The scope and specification of the field investigations will be set out in a separate Archaeological Evaluation Strategy and appropriate Written Schemes of Investigation (WSIs), which will be subject to agreement with HMAG.

Environmental Statement:

- 6.2.53 The ES will include a cultural heritage chapter which will summarise the results of the DMRB detailed assessment and EIA.

Assumptions, Limitations and Uncertainties

- 6.2.54 A programme of archaeological field investigations, incorporating archaeological geophysical surveys and archaeological trial trenching, has been undertaken in targeted areas during the previous route optioneering stage, within and outside of the WHS, to inform the selection of the proposed Scheme. Further archaeological evaluation will be carried out as appropriate to support the EIA.
- 6.2.55 Extensive parts of the proposed Scheme were subject to investigation as part of the 2004 Published Scheme, including geophysical survey and trial trenching. Review of these indicates that additional survey and/or re-survey will be required to: a) ensure comprehensive coverage of the proposed Scheme; and b) to overcome limitations in the historic surveys relating to technical advances, evolving best practice and minimum standards, in order to ensure a robust baseline assessment.
- 6.2.56 It is assumed that there will be access to all required land to undertake both intrusive and non-intrusive archaeological surveys, and that the results of the surveys will be available to incorporate within the EIA and ES.

6.3 Landscape and Visual

Introduction

- 6.3.1 This section considers the two related sub-topics of landscape and visual effects. For the purposes of this section of the Scoping Report, the term 'landscape' is synonymous with both rural landscapes and urban landscapes or townscape.
- 6.3.2 Landscape effects relate to the direct physical changes to the fabric or individual elements of the landscape. They also relate to the potential indirect changes to the wider patterns of land use, land cover and the arrangement of landscape features which determine the character and the aesthetic and perceptual qualities of the landscape.
- 6.3.3 The assessment of visual effects addresses potential changes in the composition, quality and amenity value of existing views as a result of the change or loss of existing landscape elements, and/or the introduction of new elements, taking into account the extent to which the proposed Scheme would be visible from visual receptors. The nature and quality (or visual amenity value) of available views in a landscape as experienced by people can be a key influence on their quality of life.
- 6.3.4 This section has been prepared in accordance with IAN 135/10 Landscape and Visual Effects Assessment, Highways England, 2010 (Ref 60), but set within the context of the more recent Guidelines for Landscape and Visual Impact

Assessment 3rd Edition (GLVIA3), Landscape Institute and the Institute for Environmental Management and Assessment, 2013 (Ref 61).

- 6.3.5 Both documents state that the main objectives of the scoping exercise are to determine whether or not the proposed Scheme is likely to give rise to any landscape or visual effects, and to define the level of detail required for any further Landscape and Visual Impact Assessment (LVIA) study within the ES.
- 6.3.6 There are likely to be some overlaps between effects associated with Landscape and Visual and Cultural Heritage, Ecology and Noise. Constraints relevant to other topics are assessed in detail within the relevant section, but are also referenced in this section in terms of landscape and visual effects where appropriate.
- 6.3.7 Mitigation required for Cultural Heritage, Ecology and Noise effects will be incorporated into the overall environmental design along with the landscape mitigation and enhancements.

Study Area

- 6.3.8 The initial study area for this section of the scoping report covers a distance of 5km from the proposed centreline of the proposed Scheme (Figure 6.2) with a more detailed study area of 2km (Figure 6.3) for the proposed Scheme centreline. Beyond this study area it is considered that the proposed Scheme would be unlikely to give rise to any significant effects on landscape or visual receptors due to the scale and massing of the proposed built elements and associated operational elements (i.e. the traffic moving along the road), and the intervening landform and vegetation.
- 6.3.9 The study area will be reviewed as the proposed Scheme develops and the final study area to be used for the EIA will ensure all works, including High Load Routes and construction compounds, are considered, in defining the final study area boundary. As such the final study area will be informed by a range of computer generated Zones of Theoretical Visibility (ZTV), which will be prepared in accordance with GLVIA3, and verified by site visit.

Planning Policy Context

- 6.3.10 The following planning policies have been taken into account as part of the assessment relating to landscape and views:
 - a) National Networks National Policy Statement (NNNPS): designation, January 2015, sections 5.84, 5.85, 5.89, 5.144-147, 5.150, 5.156 and 5.158-161;
 - b) National Planning Policy Framework (NPPF), March 2012, paragraphs 109, 115 and 125;
 - c) Wiltshire Council Core Strategy Development Plan Document, Adopted January 2015, Policies 51-52 and 57-59; and
 - d) Saved policies of the North Salisbury Local Plan 2011 adopted in 2003, Saved Policy C6.

- 6.3.11 The NPPF Planning Practice Guidance sections 7 (Requiring Good Design) and Section 11 (Conserving and enhancing the natural environment) have also been taken into account and provide further detail regarding policies and sensitivities for landscape and views. This is also the case for the Stonehenge, Avebury and Associated Sites World Heritage Site Management Plan, 2015 which also contains policies relevant to landscape and views.

Baseline Conditions

- 6.3.12 Fieldwork has been undertaken between July and September 2017 from publicly accessible land to identify areas, features and viewpoints of landscape and visual amenity value within the study area. In addition to the fieldwork, further detailed desk-based review of relevant information has also been undertaken.
- 6.3.13 Identified landscape receptors within the study area include:
- a) chalk downland landscape character types;
 - b) chalk river valley landscape character types, including the rural settlements within these;
 - c) statutory landscape designations including the eastern fringe of the West Wiltshire Downs and Cranborne Chase Area of Outstanding Natural Beauty (AONB);
 - d) non-statutory locally designated Special Landscape Area;
 - e) the wider landscape setting (or their visual and contextual relationship with their surroundings) of several heritage features including the Stonehenge, Avebury and Associated Sites World Heritage Site (WHS) and Amesbury Abbey, a Grade II* Registered Historic Park and Garden (RHPG); and
 - f) a range of physical landscape features that are highly characteristic of the landscape types that they are located within.
- 6.3.14 The townscape areas of Amesbury, Durrington and Bulford have been scoped out from this landscape assessment. This is due to the fact that there are no direct impacts (as the proposed Scheme would not run through these townscape areas) and lack of inter-visibility as a result of intervening topography, buildings and vegetation.
- 6.3.15 Visual receptors within the study area have been established as:
- a) leisure and tourism visitors to the Stonehenge visitor centre;
 - b) leisure and tourism visitors to the Stonehenge monument;
 - c) leisure and tourism visitors to other heritage features in the WHS;
 - d) users of recreational facilities, such as open access land;
 - e) recreational users of public rights of way (PRoW), including walkers, cyclists and equestrian users;

- f) residential properties as follows:
 - i. within Winterbourne Stoke;
 - ii. the southern periphery of Strangways;
 - iii. the northern periphery of Amesbury;
 - iv. the western periphery of Amesbury;
 - v. along the A345 to the north of Countess Roundabout;
 - vi. scattered residential dwellings across the open downland areas;
- g) people working at and visiting Countess Services;
- h) the public house in Winterbourne Stoke; and
- i) users of roads.

6.3.16 The key areas, features and receptors of landscape and visual amenity identified within the study area are summarised below.

National landscape character

6.3.17 Natural England has mapped 159 separate, distinctive national character areas (NCA) across the UK. These are intended to inform and contribute towards policy development and local planning, action and development..

6.3.18 The study area lies wholly within NCA 132 Salisbury Plain and West Wiltshire Downs, which is strongly influenced by the underlying chalk (Natural England, 2013) (Ref 62). The chalk downs have a characteristic rounded landform containing dry valleys running down into larger more fertile river valleys which contain settlements. The downland landscape is typically composed of large arable fields with few hedges or trees, punctuated by geometric copses and with extensive views, particularly from the ridgelines. In contrast the river valleys contain low-lying small-scale fields, woodland on valley slopes and settlements, and are much more enclosed.

Local landscape character

6.3.19 At the county scale, the study area lies within the following Landscape Character Types (LCTs) and subdivided Landscape Character Areas (LCAs) identified by the Wiltshire Landscape Character Assessment (2005), (Ref 63):

- a) High Chalk Plain LCT – 3A Salisbury Plain West;
- b) High Chalk Plain LCT – 3B Salisbury Plain East;
- c) Chalk River Valley LCT – 5D Upper Avon Chalk River Valley; and
- d) Chalk River Valley LCT – 5E Wylve Chalk River Valley.

6.3.20 At the district scale, the South Wiltshire/Salisbury District Landscape Character Assessment (2008) (Ref 63) refines and subdivides the county level LCTs and

LCAs and defines the following District Landscape Character Areas, across the study area:

- a) A1 Till Narrow Chalk River Valley;
- b) A2 Upper Avon Narrow Chalk River;
- c) D2 Tilshead Chalk Downland;
- d) D3 Larkhill and Winterbourne Chalk Downland; and
- e) D4 Boscombe Down Chalk.

6.3.21 The South Wiltshire/Salisbury District Landscape Character Assessment also notes several urban areas including Amesbury, Bulford and Durrington within the 2km study area.

6.3.22 Overall, the landscape character of the study area is distinguished by three principal features:

- a) large-scale, smooth, rolling chalk downland with a strongly exposed character and sensitive landscape elements, including numerous archaeological features. Sense of tranquillity is generally strong, but this varies dependent on the level of military activity and traffic noise from the A303 road corridor;
- b) relatively enclosed, narrow, incised chalk valleys, with intricate pattern of sinuous woodland belts and small pasture fields and a dispersed, scattered settlement pattern; and
- c) wide variety of important visible archaeological features.

Landscape designations

6.3.23 A large part of the study area east of the A360/B3086 and west of the A345 lies within the WHS (Figure 6.4). Whilst this area is considered within the Cultural Heritage assessment, it is identified as part of the landscape section, as it has a wider setting in the landscape and contains important elements in determining the landscape character baseline of the surrounding landscape.

6.3.24 In the Stonehenge part of the WHS, the prehistoric monuments and sites are typically associated with ridgelines and have strong visual inter-relationships with each other and in some cases with monuments and sites outside of the WHS (see Section 6.2, Cultural Heritage for further information) as well as its wider setting in the surrounding landscape.

6.3.25 A small part of the Cranborne Chase & West Wiltshire Downs AONB extends just into the 2km study area to the south-west of Winterbourne Stoke. The topography of this part of the AONB is more varied than the smooth rounded downs, steeply cut combs and dry valleys of the AONB outside of the study area to the south.

6.3.26 The majority of the study area for the Scheme is classified as a non-statutory Special Landscape Area within the Wiltshire Core Strategy.

- 6.3.27 There is one Registered Park and Garden within the study area, namely Amesbury Abbey, which is Grade II* listed. It lies to the south of the existing A303, to the south-west side of Countess Roundabout. There are also five Conservation Areas within the study area at Winterbourne Stoke, Berwick St James, West Amesbury, Amesbury and Bulford. Whilst these features are considered within the Cultural Heritage assessment, they are also identified as part of the landscape section, as they can be important elements in determining the landscape character of the baseline.
- 6.3.28 A woodland belt south-west of the Countess Roundabout, north-west of Amesbury is subject to a Tree Preservation Order (TPO). The TPO trees are not within the highway boundary. North of the A303, west of the Countess Roundabout a series of trees and small groups of trees, known as the 'Nile Clumps', are also subject to a TPO. Further TPOs are scattered throughout the study area. Information regarding TPOs within the study area will be updated in subsequent consultation with local authorities as the proposed Scheme develops.
- 6.3.29 Other designations of some relevance to landscape, though not necessarily indicative of landscape quality, include the River Avon System SAC/SSSI, River Till SSSI, and Parsonage Down, which is a National Nature Reserve, a designated SSSI and is within Salisbury Plain SAC. The potential impacts on these designations are considered within Section 6.4 Biodiversity.

Tranquillity

- 6.3.30 IAN 135/10 defines tranquillity as “the remoteness and sense of isolation, or lack of it, within the landscape, which is often determined by the presence or absence of built development and traffic.” As explained in the Landscape Institute’s Technical Information Note (TIN) 01/2017 (Ref 65), it is a perceptual aspect of landscape and will be considered as part of the landscape character assessment, which will form the baseline against which the landscape effects of the proposed Scheme will be assessed.
- 6.3.31 Existing road infrastructure of the A303 is noted as one of the elements adversely affecting tranquillity within the NCA 132 profile.

Views and visual amenity

- 6.3.32 Key viewpoints, which will be illustrated with panoramic photography, will be agreed with Wiltshire Council, English Heritage, Historic England, Natural England, National Trust and Cranborne Chase & West Wiltshire Downs AONB as appropriate. These will be informed by a Preliminary ZTV study (Figures 6.2 and 6.3).
- 6.3.33 Representative viewpoints will be used to assess the views available to visual receptors or groups of receptors at a given location. These viewpoints will be selected to represent receptors with high sensitivity, which are most likely to experience significant effects. A total of 42 initial viewpoints have been identified within the study area for this scoping report and are focussed on the main A303 centreline proposals (see Figure 6.3). As the proposed Scheme develops these will be reviewed and updated to account for proposed Scheme changes and additions including offline proposals.

- 6.3.34 Viewpoint photography will be undertaken in summer 2017 and winter 2017/18 in order to capture both summer and winter views.
- 6.3.35 The viewpoint locations will be kept under review as the Scheme develops, and confirmed in consultation with stakeholders, but as a minimum, key viewpoints will illustrate the baseline visual amenity for the following receptors:
- a) visitors to the Stonehenge Visitor Centre and the Stonehenge monument;
 - b) users of recreational facilities within the study area where the primary purpose of that recreation is enjoyment of the countryside; this would include open access areas around Stonehenge and across Parsonage Down;
 - c) recreational users of the extensive network of PRow within the study area; and
 - d) residential properties within the study area.
- 6.3.36 Within the ES, photomontages from principal locations will be prepared in accordance with LI Advice Note 1/11: Photography and photomontage in landscape and visual impact assessment, 2011 (Ref 66), and LI Guidance Note 02/17: Visual representation of development proposals, 2017 (Ref 67). It is anticipated that each junction and tunnel portal will require approximately three photomontages and a further approximately six photomontages will be prepared to illustrate the effects of other parts of the completed Scheme in year 15 of operation. Final photomontage locations will be agreed in consultation with stakeholders.

Value of Environmental Resources and Receptors

- 6.3.37 Overall, the study area comprises an extensive area of rural landscape with distinctive elements and features that make a positive contribution to character and sense of place, including various environmental designations such as the WHS, AONB, Registered Parks and Gardens, Conservation Areas and the Special Landscape Area.
- 6.3.38 The South Wiltshire/Salisbury District Landscape Character Assessment (2008) provides an indication of local character and the inherent sensitivity of each LCA. Those sensitivities will be reviewed as part of the LVIA, however, the study predates GLVIA3 and the more recent guidance that relates sensitivity to specific development rather than a general sensitivity.
- 6.3.39 Sensitivity will be considered as part of the LVIA and as a combination of value and susceptibility to the specific change arising from the scheme, in line with GLVIA3. Value will be defined at the baseline stage of the LVIA as recommended in paragraph 5.19 of GLVIA3, such that this information can later inform judgements about sensitivity of receptors and significance of effects of the Scheme.

Landscape Value and Sensitivity

- 6.3.40 GLVIA3 notes that the value attached to the receptor and its susceptibility to change arising from the specific proposal, should be considered separately and then combined to determine sensitivity (paragraph 3.24).
- 6.3.41 Paragraph 2.16 in Annex 1 of IAN 135/10 states that a judgement should be made as to the value of the landscape based on the results of the desk study and field surveys. This is supported by paragraphs 5.19 to 5.31 of GLVIA3. Both documents are clear that a landscape does not need to be designated to have a value. Box 5.1 of GLVIA3 sets out a range of factors that can help in the identification of landscape value, as follows:
- a) Landscape quality;
 - b) Scenic quality;
 - c) Rarity;
 - d) Representativeness;
 - e) Conservation interests;
 - f) Recreation value;
 - g) Perceptual aspects; and
 - h) Associations.
- 6.3.42 The assessment of the value of each LCA will be informed by the information set out in the baseline and the factors set out above and will be judged with reference to Table 6.6, below.

Table 6.6: Landscape Value Criteria

Classification	Value of LCA
National	Landscape with elements of national importance, e.g. protected by legislation.
Regional	Landscape with elements of regional importance, designated regional leisure routes and conservation areas.
Local	Landscape with elements which are protected or valued through local or neighbourhood planning policies, such as protected open space or groups of listed buildings or buildings of townscape merit.
Community	Landscape with relatively common elements which are likely to be valued by the community living and working in the area.
Limited	Landscape with weak or discordant elements and characteristics which detract from the quality of the area.

- 6.3.43 Susceptibility to change will be considered at the assessment stage and is defined in GLVIA3 as “the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect)

to accommodate the proposed development without undue consequences for the maintenance of the baseline situation...” (paragraph 5.40). In paragraph 5.43 it states that “Judgements about susceptibility of landscape receptors to change should be recorded on a verbal scale (for example high, medium or low)...” and this will be applied as follows:

- a) High – the receptor has a low capacity to accommodate the proposed development without effects upon its overall integrity. The landscape is likely to have a strong pattern/texture or is a simple but distinctive landscape and/or with high value features and essentially intact.
- b) Medium – the receptor has some capacity to accommodate the proposed development without effects upon its overall integrity. The pattern of the landscape is mostly intact and/or with a degree of complexity and with features mostly in reasonable condition.
- c) Low – the receptor is robust; it can accommodate the proposed development without effects upon its overall integrity. The landscape is likely to be simple, monotonous and/or partially degraded with common/indistinct features and minimal variation in landscape pattern.

6.3.44 Paragraph 3.9 of Annex 1 of IAN 135/10 states that “the outputs from the landscape character assessment (i.e. landscape characteristics, their condition and value) should be considered to assess their sensitivity to changes arising from the project”. The identification of sensitivity, therefore, needs to consider the value of the landscape alongside the susceptibility to the nature of the change, i.e. the type and scale of development proposed within a particular area or type of landscape and the association and tolerance of the identified landscape or individual contributing elements thereof, to that change.

6.3.45 The criteria in Table 6.7 below, developed from those set out in Table 2 of Annex 1 of IAN 135/10 and in consideration of the later guidance within GLVIA3, will be applied when combining judgements to determine landscape sensitivity.

Table 6.7: Landscape Sensitivity

Classification	Description
High	<p>Landscape of national or regional value with distinctive elements and characteristics, highly susceptible to small changes of the type of development proposed without unacceptable consequences for the maintenance of the baseline situation. Typically these landscapes would be:</p> <ul style="list-style-type: none"> • Of high quality with distinctive elements and features making a positive contribution to character and sense of place. • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale. • Areas of special recognised value through use, perception or historic and cultural associations. • Likely to contain features and elements that are rare and could not be replaced.
Medium	<p>Landscape of local or community value, with mostly common elements and characteristics, which by nature of their character would be able to partly accommodate change of the type proposed without undue consequences for the maintenance of the baseline situation. Typically these would be:</p> <ul style="list-style-type: none"> • Comprised of mostly commonplace elements and features creating

Classification	Description
	<p>generally unremarkable character but may include some rarer elements and with some sense of place.</p> <ul style="list-style-type: none"> Locally designated, or value may be expressed through non-statutory local publications. Containing some features of value through use, perception or historic and cultural associations. Likely to contain some features and elements that could not be replaced.
Low	<p>Landscape of community or limited value and relatively inconsequential elements and characteristics, the nature of which is potentially tolerant of substantial change of the type proposed. Typically these would be:</p> <ul style="list-style-type: none"> Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place. Not designated. Containing few, if any, features of value through use, perception or historic and cultural associations. Likely to contain few, if any, features and elements that could not be replaced.
Limited	<p>Despoiled or degraded landscape with little or no evidence of being valued by the community.</p>

6.3.46 Most of the study area is considered to be Medium to High value on account of the presence of elements of national and regional importance but with the presence of military training activities and road infrastructure. Sections of higher value include central sections of the proposed Scheme within the Larkhill and Winterbourne Chalk Downland LCA which includes the WHS.

6.3.47 Many of the settlements both north and south of the existing A303 incorporate conservation areas and listed buildings, which contribute to further localised areas of high landscape value throughout the study area. From east to west these include the conservation areas of Bulford, Amesbury, West Amesbury, Winterbourne Stoke and Berwick St James. There is also a RPG at Amesbury Abbey, to the south-west of Countess Roundabout on the existing A303.

Visual receptor value and sensitivity

6.3.48 Annex 3 of IAN 135/10 defines visual amenity as the value of a particular area or view in terms of what is seen. GLVIA3 also stresses the importance of considering the value of views, for example in relation to heritage assets, or through planning designations and provides a list of indicators of the value attached to views in paragraph 6.37, including:

- Appearance in guidebooks or tourist maps;
- Provision of facilities, such as parking places, sign boards and interpretive materials; and
- References in literature or art.

- 6.3.49 The assessment of the value of views will be informed by the location of the viewing place and the quality or designation of the existing elements in the view, as shown in Table 6.8, below.

Table 6.8: Value of views

Classification	Value of view
National	Recognised or iconic views within nationally/internationally designated landscapes, such as National Parks, AONB or WHS and/or national/international landmarks with views recognised in planning policy and/or management plans.
Regional	Views or viewing places identified in landscape frameworks or regional strategies.
Local	Views across high quality landscape which might include features of interest, such as landmarks, which may be identified in the Local Plan.
Community	Views of relatively common landscape elements, likely to be valued by the communities which experience the view.
Limited	Views across poor quality landscape with a high degree of detracting or common elements.

- 6.3.50 IAN 135/10 (Ref 60) states that all residential properties, PRow and recreational facilities should be regarded as being of 'high' sensitivity, where the purpose of that recreation is for the enjoyment of the countryside.
- 6.3.51 GLVIA 3 (Ref 61) supports this, but also notes that visual sensitivity of receptors is dependent upon "*their susceptibility to change in views and visual amenity*" (paragraph 6.31) they experience at particular locations. It includes a combination of parameters, such as the activity/occupation/pastime of the receptors at particular locations; the extent to which their attention or interest may be focused on the views and the visual amenity they experience. It will comprise the location, relative focus and orientation of particular views, the quality or importance of the existing view and its attractiveness or scenic quality; the principal or secondary interest in that particular view; the static or sequential nature of views; the ability of the view to accommodate the type of development and the frequency and duration of the view. These are detailed further in Table 6.9.
- 6.3.52 GLVIA 3 (Ref 61) notes that the divisions between categories are not always clear cut and "*in reality there will be a gradation in susceptibility to change*", (paragraph 6.35). On this matter GLVIA3 advises that each project should consider the nature of the landscape and groups of people who will be affected and for visual receptors "*the extent to which their attention is likely to be focused on views and visual amenity*" (paragraph 6.35). For the purposes of this assessment therefore, susceptibility of visual receptors to change will be defined as set out in Table 6.9 below.

Table 6.9: Susceptibility to change of views

Nature of Visual Receptor	Susceptibility to change		
	High	Medium	Low
Occupation or activity	People living in the area or visiting areas because of their high landscape value	People passing through the area on designated routes	People working inside or passing through the area on public roads or railway lines
Degree of attention on the view	Views are an important part of the experience of the landscape	Views are relevant to the experience or activity but not central to it	Views are likely to be focused on the activity of the receptor, rather than the view
Degree of exposure to the view	Views are likely to be open	Views may be framed, partially screened or filtered	Views are likely to be limited to glimpses or are heavily screened
Length of exposure to the view	Views are likely to be experienced daily or for long periods of time	Views may be fleeting or experienced as a sequence of views moving through the area	Views are likely to be short

- 6.3.53 Paragraphs 2.15 and 2.16 in Annex 2 of IAN 135/10 (Ref 60) provide advice on determining the sensitivity of visual receptors. This is supported by GLVIA3 which states that each visual receptor “*should be assessed in terms of both their susceptibility to change in views and visual amenity and also the value attached to particular views*” (paragraph 6.31). The criteria set out in Table 6.10 below, which draws reference from Table 2 in Annex 2 of IAN 135/10 (Ref 60), will be applied in determining the sensitivity of visual receptors.

Table 6.10: Sensitivity of visual receptors

Classification	Activity of Visual Receptor
High	Activity resulting in a particular interest or appreciation of the view (e.g. residents or people engaged in outdoor recreation whose attention is focused on the landscape and where people might visit purely to experience the view, such as promoted viewpoints) and/or a view of national value (e.g. within/towards a designated landscape).
Medium	Activity resulting in a general interest or appreciation of the view (e.g. visitors staying within an area such as a caravan or camping site, people in schools or other institutional buildings and hotels and people passing through the landscape on cycle routes or identified scenic road routes) and/or a view of local or limited value (e.g. agricultural land or urban areas).
Low	Activity where interest, appreciation or period of exposure to the view is limited (e.g. people at work, motorists travelling through the area or people engaged in outdoor recreation that does not focus on an appreciation of the landscape) and/or a view of limited value (e.g. industrial areas or derelict land).

Potential Impacts and Mitigation

- 6.3.54 GLVIA 3 notes the use of different terms for ‘impact’ and ‘effect’ within LVIA. For the purpose of this assessment and in line with GLVIA3 (paragraph 1.15) (Ref

61), the term 'impact' is defined as the process of assessment and the action being taken, and the 'effect' is defined as the change resulting from that action.

Construction Effects

- 6.3.55 The construction phase would involve the permanent loss of some landscape elements, including removal of sections of the existing A303 highway, and the introduction of new features in the landscape. Areas of agricultural land (both arable and pasture), trees and hedgerows have the potential to be permanently lost to accommodate the proposed Scheme. There would also be a permanent alteration to landform.
- 6.3.56 As well as the usual plant, materials and equipment that would be required to remove the existing A303 highway, construct the new road, bridges, junctions and tunnel portals, potential landscape character and visual impacts are likely to result from the following construction elements:
- a) Vegetation removal and soil stripping;
 - b) Movement of construction plant;
 - c) Use of tall cranes and other machinery during construction of bridges and other structures;
 - d) Contractors' compounds, particularly when lit;
 - e) Vehicle haul routes;
 - f) Temporary lighting needed for the works;
 - g) Areas of extraction for the tunnel and to provide construction materials;
 - h) Excavation of flood compensation areas and other drainage features;
 - i) Stockpiled soil and materials and redistribution of excavated spoil; and
 - j) Diversion of traffic.
- 6.3.57 The most prominent elements of the proposed Scheme are expected to be the tunnel portal areas, the construction of grade separated junctions, the construction of a bridge over the River Till, and areas involving substantial cut and fill operations, including removal of the existing A303 highway.
- 6.3.58 During the construction period several sensitive receptor groups, including residential properties and users of recreational facilities and PRow, are likely to experience short term adverse visual effects. Many of these visual effects are likely to be significant, particularly for some residential properties in Winterbourne Stoke, a small number of scattered residential receptors across the open downland areas, users of parts of the open access land around Stonehenge and Parsonage Down and PRow that run close to, or cross, the Scheme.
- 6.3.59 There would also be short term adverse construction effects on landscape character which would likely be significant in places.

- 6.3.60 Some landscape and visual effects during construction could be mitigated to some extent. Potential mitigation measures include for example:
- a) Retained vegetation would be protected during construction in accordance with current best practice.
 - b) Where bunds are proposed as part of the permanent works, they would be constructed as early as is practicable to provide screening to the construction work. Where land would be used temporarily, such as for compounds, haul roads, regrading areas, etc., then this would be returned to a condition suitable for the continuation of its original use. This would include the appropriate replanting of hedgerows and trees, where removal could not be avoided.

Operational Effects

- 6.3.61 Potential beneficial landscape and visual effects of the proposed Scheme during operation would result from the closure of the existing A303 through part of the WHS. Visitors to the Stonehenge monument, recreational users of the National Trust open access land and permissive paths, and PRoW users, have the potential to experience improvement in views.
- 6.3.62 Potential adverse landscape and visual effects of the proposed Scheme during operation would be associated with new or altered highway infrastructure through the landscape, particularly associated with tunnel portals, bridges and grade separated junctions, vehicular movements, lighting, gantries and signage.
- 6.3.63 Potential landscape and visual mitigation of operational effects includes the development and integration of a landscape and environmental strategy for the proposed Scheme that is responsive to the open chalk grassland landscape and the contrasting river valley landscape that the proposed Scheme passes through, enhances biodiversity and adopts an uncluttered approach to design and materials. The strategy would also seek to identify opportunities to mitigate impacts on the physical landscape. This would include minimising cut and fill adjustments of the natural topography or increasing the footprint and reducing the gradient of cut and fill operations to allow for natural contours that flow into the surrounding landscape. The preferred approach would depend on the immediate landscape context and on constraints of other environmental and heritage factors.

Assessment Methodology

- 6.3.64 The improvement of the A303 between Amesbury and Berwick Down is a major highway scheme that would affect an extensive area of rural landscape, which includes a WHS. In addition, there are large numbers of highly sensitive visual receptors. It is likely that there would be some significant construction and operational landscape and visual effects. It is therefore proposed that a Detailed Assessment of the Scheme is undertaken in accordance with guidance on Landscape and Visual Effects Assessment of highways projects contained in IAN 135/10.
- 6.3.65 As IAN 135/10 (Ref 60) is based on the 2002 Guidelines for Landscape and Visual Impact Assessment (GLVIA2), the principles of the 2013 GLVIA 3 will also

be taken into account. The approach to the detailed assessment will also have regard to the updated interim guidance on more effective, proportionate and efficient environmental assessment of highways projects provided in IAN 125/15 Environmental Assessment Update (Ref 18) as noted in 6.3.73 c). In line with IAN 135/10 the landscape and visual impact assessment will consider the impact at the following points in time:

- a) During construction;
- b) In the winter of the year of opening (to represent a worst-case scenario of operation, before any planted mitigation can take effect), taking account of the completed Scheme and the traffic using it; and
- c) In the summer of the fifteenth year after project opening (to represent a least effect scenario, where any planted mitigation measures can be expected to be reasonably effective), taking account of the completed project and the traffic using it.

6.3.66 The assessment will include a summary of night time lighting situations where these are considered to provide a key change (adverse or beneficial) and against the situation that would exist if the proposed Scheme were not to proceed (i.e. the 'Do Minimum').

6.3.67 The LVIA will also consider the future baseline and potential receptors connected with known developments that have not been built yet, or are subject to planning permission. This will be limited to developments completed before the proposed Scheme is under construction, or otherwise they will be treated as part of the cumulative assessment. These will be clarified at the detailed assessment stage.

6.3.68 The methodology will follow the process set out in Figure 3.5 of GLVIA3.

6.3.69 IAN135/10 and GLVIA3 form the standard reference for undertaking LVIA for major roads schemes in the UK. The guidance is not prescriptive and therefore a tailored approach is required which is flexible and recognises the importance of professional judgement.

6.3.70 In accordance with IAN135/10 and GLVIA3 both the landscape assessment and the visual assessment will include baseline studies (desk based and field survey) and a corresponding assessment of the effects of the proposed Scheme.

Assessment of Landscape Effects

6.3.71 The assessment of landscape effects will follow reporting levels described in IAN135/10 and GLVIA3 as follows:

Landscape baseline

- a) Existing landscape designations will be identified and appraised;
- b) A detailed review of existing landscape character assessments will be carried out to inform the classification of the landscape into LCTs and/or LCAs, including a description of the key characteristics of each, and an appraisal of their condition and value, together with a map showing the boundaries of different areas. The existing boundaries will also be verified

and updated where appropriate to show the relevant level of detail and change in the patterns of characteristics, within the study area for the proposed Scheme;

- c) Acknowledgement of key elements, features or characteristics that are important or valued within the local context or in determining the local character (e.g. a green lane used as a footpath), and which provide a sense of place;
- d) A photographic record of fieldwork will be prepared and numbered and cross-referenced to accurately plotted locations over an OS map of appropriate scale, which will also show the angle of view. The photographic survey will record important features and elements, variations in character and provide representative images of each character area; and
- e) Forces of change on the landscape, including changes in landscape management practice, climate change and development will be described.

Landscape sensitivity

- f) The sensitivity of landscape receptors will be defined in accordance with the methodology set out above.

Magnitude of landscape Impact;

- g) The magnitude of impact will be determined by considering the size, scale, duration and intensity of the proposed change, the geographical extent of the area influenced, the type of development, the level of integration of new features with existing elements, and its duration and reversibility. Magnitude of impact will be classified as set out in Table 1 in Annex 1 of IAN 135/10 and as defined in Table 6.11 below; and
- h) The mitigation measures proposed to avoid, reduce or remedy adverse effects will be described. These measures will be integrated into the design of the Scheme and the residual effects will therefore be the net effects arising from the project complete with mitigation.

Table 6.11: Magnitude of landscape impact criteria

Magnitude of impact	Typical criteria descriptors
Major	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements. (Adverse) Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features. (Beneficial)
Moderate	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements. (Adverse) Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features. (Beneficial)
Minor	Slight loss or damage to existing character or features and elements, and/or

	the addition of new but uncharacteristic features and elements. (Adverse) Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements. (Beneficial)
Negligible	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements. (Adverse) Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements. (Beneficial)
No change	No noticeable loss, damage or alteration to character or features or elements.

Significance of landscape effects

- 6.3.72 The significance of landscape effects will be determined Table 3 in Annex 1 of IAN 135/10 as a basis (Ref 60). This will be refined to provide an appropriate level of detail in line with the methodology above. In doing so, it will consider the relationship between the sensitivity of the resource and the magnitude of effect. In line with GLVIA3 (Ref 61), these conclusions on significance will be supported by a narrative that justifies the reason for the level given. It will include the effect of individual aspects of the Scheme as well as their combined effect (e.g. the road, plus its traffic, lighting and signage), and effects on the whole landscape (e.g. changes in character) as well as specific features and elements).

Assessment of Visual Impacts

- 6.3.73 The assessment of visual effects will follow reporting levels described in IAN135/10 (Ref 60) and GLVIA3 (Ref 61) as follows:

Visual baseline

- a) Annex 2 of IAN 135/10 refers to the preparation of a Zone of Visual Influence (ZVI) in order to show the area of land from which there could be a view of any part of the proposed project (paragraph 2.2). It acknowledges that this may be determined by computer analysis and GLVIA3 supports this, recommending that a ZTV is prepared. In paragraph 6.9 it states that “*In the case of linear developments such as road or rail schemes the ZTV must be constructed for a sequence of points along the road*” and that this should take account of the height of structures such as bridges and gantries. ZTVs will therefore form the basis of identifying visual receptors potentially affected by the Scheme within the LVIA.
- b) Important viewpoints will be discussed and agreed with the relevant stakeholders, as identified above. The importance of local landmarks and viewpoints, and the assessment of the extent and direction of views from properties will be recorded. The assessment will also take into consideration any committed development (i.e. developments with planning consent and/or development allocations in adopted local plans), if they will be completed before the Scheme is under construction, or they will be treated as part of the cumulative assessment, as noted above.
- c) Visual receptors and receptor groups that would be affected by the Scheme will be mapped and the extent and quality (amenity) of their existing views

will be described. In line with paragraph 6.19 of GLVIA3, representative, specific and illustrative viewpoints will be identified and used to illustrate effects on views where applicable. The GLVIA3 approach of a range of viewpoint types to reflect the range of likely changes in visual amenity will be adopted with receptors grouped in 'clusters' as noted at 6.3.80, rather than use of a full Visual Effects Schedule (VES) as envisaged under IAN135/10.

- d) A photographic record showing views from representative viewpoints will be prepared and appropriately referenced on maps, with details of each viewpoint and photograph recorded in line with Landscape Institute (LI) Advice Note 1/11.

Magnitude of visual impact

- e) The magnitude and type of visual impact will relate to the scale, duration and reversibility of change which the Scheme would potentially bring to existing views and visual receptors. The proposed criteria for assessment of the magnitude of visual impact will be classified using Table 2 in Annex 2 of IAN 135/10 and as defined in Table 6.12, below.
- f) Photomontages from principal locations close to the three main junctions and structures, including the Countess Roundabout; the east and west tunnel portals; the Longbarrow grade separated junction and the River Till viaduct will be prepared in accordance with LI Advice Note 1/11 and LI Guidance Note 02/17 (Ref 67).
- g) A description of the mitigation measures proposed to avoid, reduce or remedy adverse visual effects will be described and illustrated. These measures will form an integral part of the project, and the effects assessed will therefore be the net effects arising from the project complete with mitigation.

Table 6.12: Magnitude of visual impact criteria

Magnitude of impact	Typical criteria descriptors
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No change	No part of the project, or work or activity associated with it, is discernible.

Significance of visual effects

- h) The significance of visual effects will be determined using Table 3 in Annex 1 of IAN 135/10 as a basis (as Table 6.13 below). This will be refined to provide an appropriate level of detail in line with the methodology above. In doing so it will consider the relationship between the sensitivity of the resource and the magnitude of effect. In line with GLVIA3, these conclusions on significance will be supported by a narrative justifying the reason for the level given.
- i) The LVIA will include a summary of likely significant visual effects for visual receptor groups identified within the study area. Schedules will be prepared to support these summaries and will be illustrated on a series of Visual Effects Drawings (VED) in line with Annex 2 of IAN 135/10.
- j) The process of forming a judgement as to the significance of effect is based upon the assessments of magnitude of effects and sensitivity of the receptor to come to a professional judgement of how important the effect is. Judgements within the assessment will be supported by substantiated reasoning as noted in GLVIA paragraphs 3.32 to 3.36.

Table 6.13: Significance of landscape and visual effect categories

Sensitivity of landscape / visual receptor	Magnitude of landscape/visual impact				
	No change	Negligible	Minor	Moderate	Major
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Moderate	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

Preparation and Use of Landscape Figures and Visuals

- 6.3.74 The ZTV described in this section will be verified and mapped in line with the approaches recommended in GLVIA 3, paragraphs 6.6 to 6.12.
- 6.3.75 GLVIA3 is the industry standard guidance for LVIA. LI Guidance Note 02/17 Visual representation of development proposals (also sometimes known as “Proportionality” guidance) supports GLVIA3 by directing clients, regulators and practitioners towards an appropriate choice of technique when seeking visual representations of developments.
- 6.3.76 Site photography and photomontage work will also be carried out in line with ‘Photography and photomontage in landscape and visual impact assessment’ (Landscape Institute Advice Note 01/11, 2011).
- 6.3.77 Photographs will, as far as practicable, be captured during summer and winter months.

Assumptions, Limitations and Uncertainties

- 6.3.78 Access to viewpoints may be restricted to publicly accessible areas and sections of private land where access had been agreed. Where access is limited, site work will be undertaken from the nearest publicly accessible location and noted within the assessment. The consequential evaluation for impacts on some private and/or inaccessible viewpoints will be made, therefore, based upon the professional judgement of suitably qualified and experienced specialists.
- 6.3.79 The number of residential properties will be calculated from site assessment and use of address point data, where available, and any other mapping information where close access to the receptor was not possible and/or where address point data was not available.
- 6.3.80 Where appropriate, visual receptors will be grouped together as 'clusters' within the same receptor group at points where they are likely to experience the same level of effect.
- 6.3.81 The number of business receptors has been assumed as one per receptor group where businesses are situated in close proximity to one another and would experience the same visual effects. This is because it might not be possible to gain a clear understanding of the number of separate businesses in some areas.
- 6.3.82 Impacts on views from the proposed Scheme highway (i.e. driver views) will be considered in the People and Communities section (Section 6.8).
- 6.3.83 Impacts on views from existing and slightly realigned PRoW will be assessed. The final alignments for these are not yet decided as to whether they will include overbridges or underpasses across the proposed Scheme.
- 6.3.84 Impacts on forthcoming visual receptors including those subject to planning permission will be assessed where developments are known and are completed before the proposed Scheme is under construction, or otherwise they will be treated as part of the cumulative assessment. These will be clarified at the detailed assessment stage.
- 6.3.85 Only visual receptors within the ZTV that would experience a potentially significant adverse or beneficial effect will be assessed in full. Whilst there are likely to be a number of other receptors that would experience views of parts of the proposed Scheme, these will not be recorded in detail where the significance of effect would be neutral or slight at all timescales.
- 6.3.86 Existing vegetation outside the proposed draft DCO site boundary would screen or filter views from some locations and will be taken into account within the assessment of visual impacts in accordance with IAN 135/10. Changes to this vegetation would potentially affect the visual impacts caused by the proposed Scheme, but the management and retention of such vegetation is outside the control of Highways England.

6.4 Biodiversity

Introduction

- 6.4.1 This section describes the potential effects of the Scheme on biodiversity. The Scheme has the potential to give rise to direct physical impacts, such as the use of land for the construction of the scheme, with its potential for habitat loss and indirect impacts such as noise, lighting or changes in air quality, which have the potential to disturb wildlife or affect the quality of habitats.
- 6.4.2 The proposed Scheme also has the potential to give rise to many positive outcomes for biodiversity, including the:
- a) creation of a new greenway along the original alignment of the A303 after traffic has been diverted into the new tunnel;
 - b) creation of chalk grassland on extensive cuttings and embankments;
 - c) creation of green bridges, providing links and stepping stones for protected and priority species, and others; and
 - d) removal of habitat severance from the A303 in the 2.9km section where the existing A303 is replaced by the construction of the tunnel.

Study Area

- 6.4.3 To define the total extent of the study area for ecological assessment which will be reported in the ES, the proposed Scheme was reviewed in order to identify the spatial scale at which ecological features could be affected. The study area has been defined by determining a zone of influence encompassing all likely ecological effects of the proposed Scheme, including those which will occur by land-take and habitat loss or degradation and those which will occur through disturbance, such as noise.
- 6.4.4 Desk study information was collated for designated sites as follows:
- Sites designated at an International/ European level (Special Area for Conservation (SAC), Special Protected Area (SPA) and Ramsar) up to 2km from the Scheme and 5km for SACs designated for bats.;
 - sites designated at a national level (Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR) were included up to 1km from the proposed Scheme; and
 - sites designated at a local level (Local Nature Reserve (LNR)) up to 500m from the proposed Scheme.

In addition, data on ancient woodlands from the Ancient Woodland Inventory for England were collated up to 500m from proposed Scheme, non-statutory designated sites as provided by the Wiltshire and Swindon Biological Records Centre (WSBRC) were included for the area within 500m of the proposed Scheme (these include County Wildlife Sites (CWS) and Royal Society for the Protection of Birds (RSPB) reserves. These search distances are considered sufficient to identify features of importance for biodiversity, including those which may be directly affected due to their occurrence on land required for the proposed

Scheme, or those which may be indirectly affected by emissions such as, drainage, noise, or changes in air quality.

- 6.4.5 The desk study area includes the proposed Scheme in its entirety and includes construction compounds, areas for landscaping and habitat creation and the Diversion Route and High-Load Route via Larkhill, as described in Section 2.2 of this Scoping Report. Defining the zone of influence² with regards to potential ecology and nature conservation impacts is an iterative process and the extent varies depending on the receptors. The desk study area encompasses the maximum likely zone of influence. For terrestrial habitats the zone of influence will generally be within 100m of the land required for construction of the proposed Scheme. Air quality modelling on other schemes has indicated that most of the nitrogen oxides (NOx) which have the potential to affect the composition of vegetation occur within this distance from the highway. The zone of influence for watercourses extends further downstream due to the potential for greater pollution dispersal and the sensitivity of the species and habitats present. Therefore, up to 2km downstream will be considered. The zone of influence for protected and priority species and priority habitats (habitats and species of principal importance in England as listed under the Natural Environment and Rural Communities (NERC) Act 2006 Section 41³ (Ref 69), considers the direct effects of habitat loss due to the construction of the proposed Scheme and potential indirect impacts, such as severance of territories or routes of dispersal. As such the extent varies according to species.

Planning Policy Context

- 6.4.6 The following planning policies have been taken into account as part of identifying the assessment methodology, receptor selection/sensitivity, potential significant environmental effects; and mitigation:
- a) National Policy Statement for National Networks (NNNPS) – paragraphs 5.34 to 5.36) in relation to biodiversity and ecological conservation and 5.84 to 5.89 in relation to dust, odour, artificial light, smoke and steam. In addition to paragraph 5.192 in relation to noise and vibration.
 - b) National Planning Policy Framework (NPPF) – paragraph 109, 115, 117, 118 and 120 in relation to conserving and enhancing the natural environment.
 - c) Wiltshire Council Core Strategy Development Plan Document – core policy 50 (biodiversity and geodiversity), core policy 57 (ensuring high quality design and place shaping, core policy 68 (water resources) and core policy 69 (protection of the River Avon SAC).

² The 'zone of influence' for a project is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. Determining the zone of influence of the project and which important ecological features could be significantly affected is a key activity of the Scoping process (taken from CIEEM, 2016 - Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater and Coastal (Second edition January 2016) (Ref 68).

³ Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006 requires the Secretary of State to publish a list of habitats and species which are of principle importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the NERC act, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

- 6.4.7 These policies identify that the proposed Scheme should seek to avoid significant harm to biodiversity conservation interests, including through mitigation and consideration of reasonable alternatives.
- 6.4.8 In addition, the proposed Scheme should seek to enhance biodiversity/nature conservation. According to Wiltshire Council Core Strategy Development Plan Document policies 68 and 69, the proposed Scheme should not negatively affect the delivery of the actions or targets of the River Basin or Catchment Management Plan, but strive to contribute towards their delivery. Measures should be incorporated during construction and operation to avoid/prevent pollution and mitigate potential disturbance effects to the River Avon SAC.

Baseline Conditions

- 6.4.9 At this stage the baseline conditions in the study area for the proposed Scheme are based on existing data for statutory and non-statutory designated sites and priority habitats previously obtained from Wiltshire and Swindon Biological Records Centre (WSBRC). Statutory designated sites and priority habitats were verified using the government environmental Geographic Information System MAGIC, aerial photography and by viewing the site from publicly accessible areas. Baseline conditions for protected and/or priority species are based on existing data previously obtained from WSBRC⁴. Additional surveys are being undertaken, as described in 6.4.28.
- 6.4.10 Designated sites in proximity to the proposed Scheme are shown in Table 6.14 below. The internationally designated River Avon SAC is crossed by the proposed draft DCO site boundary in two places; on the existing bridge east of Amesbury and a new crossing of the River Till north of Winterbourne Stoke. The proposed Scheme passes through the River Avon System SSSI and the River Till SSSI on the same crossings. The extensive Salisbury Plain SAC and SPA is located adjacent to the proposed draft DCO site boundary, near its southern extremity near Bulford Camp east of Amesbury and further north where the Diversion Route is adjacent to part of the SAC. The proposed draft DCO site boundary is also adjacent to Parsonage Down SSSI/ NNR and is located approximately 70m from Yarnbury Castle SSSI.
- 6.4.11 Six CWS fall partially within the proposed draft DCO site boundary, namely Parsonage Down CWS, Stonehenge Down CWS, Luxenborough Banks CWS, Countess Cutting CWS, Woodhenge Verge CWS and Countess Farm Swamp CWS. In addition Little Down CWS and Yarnbury Down CWS are adjacent to the provisional DCO boundary and a further six sites are within 500m of the provisional DCO boundary (Boscombe Down Railway Line CWS, Durrington Meadows CWS, Vinies Farm Meadow CWS, Wilsford Manor Meadow CWS, Cow Down CWS and Deptford Bank CWS, distances are shown in Table 6.14).
- 6.4.12 The RSPB Reserve at Normanton Down is located approximately 225m from the proposed draft DCO site boundary. This reserve is managed for species of principle importance for the conservation of biodiversity, including stone curlew (*Burhinus oedipnemus*), which is a qualifying species for the Salisbury Plain SPA,

⁴ Highways England (2017) A303 Amesbury to Berwick Down: PCF 1 Environmental Assessment Report. Arup Atkins Joint Centure HE551506-AA-EGN-SWI-RP-YE-000021 P11, S3, 17 January 2017

located 2.2km east of the proposed Scheme and adjacent to the Diversion Route for the proposed Scheme.

- 6.4.13 No ancient woodlands were recorded (from the Ancient Woodland Inventory for England) within the study area.

Table 6.14: Designated sites of nature conservation value within the study area

Designated Sites	Proximity to the proposed Scheme	Summary of reason for designation
Statutory Designated Sites of International or European Value		
River Avon SAC	Crossed by the proposed Scheme	Annex I Habitats (primary reason): The Avon in southern England is a large, lowland river system that includes sections running through chalk and clay. Five aquatic <i>Ranunculus</i> species occur in the river system including stream water-crowfoot (<i>Ranunculus penicillatus</i> ssp. <i>Pseudofluitans</i>), river water-crowfoot (<i>R. fluitans</i>) and pond water-crowfoot (<i>R. peltatus</i>). Annex II Species (primary reason): The Avon is also designated for a range of aquatic fauna including Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>), sea lamprey (<i>Petromyzon marinus</i>), brook lamprey (<i>Lampetra planeri</i>), Atlantic salmon (<i>Salmo salar</i>) and bullhead (<i>Cottus gobio</i>).
Salisbury Plain SAC/SPA	Located adjacent to the proposed draft DCO site boundary at two locations, Parsonage Down to the west of the proposed Scheme and near Bulford camp to the far east of the proposed Scheme, and adjacent to the Diversion Route.	Annex I Habitats (primary reason): Salisbury Plain represents juniper (<i>Juniperus communis</i>) formations near the southern edge of the habitat's range on chalk in southern England. The juniper is juxtaposed with semi-natural dry grassland and chalk heath. In addition to the juniper formations, the Salisbury Plain supports semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (important orchid sites). Salisbury Plain in central southern England is believed to be the largest surviving semi-natural dry grassland within the EU and is therefore the most important site for this habitat in the UK. Annex II Species (primary reason): The Salisbury Plain is designated for the marsh fritillary butterfly (<i>Eurodryas aurinia</i>), which occurs on chalk grassland. Salisbury Plain SPA: The SPA supports important populations of stone curlew during the summer and hen harrier (<i>Circus cyaneus</i>) during the winter.
Statutory Designated Sites of UK or National Value		
River Avon System SSSI	Crossed by the proposed Scheme	A rich and varied chalk stream of national and international importance for its wildlife communities (as River Avon SAC above).

Designated Sites	Proximity to the proposed Scheme	Summary of reason for designation
River Till SSSI	Crossed by the proposed Scheme	A winterbourne chalk stream containing internationally important <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> , with an associated area of reed canary grass swamp, and supporting important fish species bullhead and salmon, and Desmoulin's whorl snail (within River Avon SAC).
Parsonage Down SSSI/ NNR	Located adjacent to the proposed draft DCO site boundary.	An area of important chalk downland with species-rich calcareous grassland (within Salisbury Plain SAC/SPA).
Yarnbury Castle SSSI	Located 65m from the proposed draft DCO site boundary.	The site supports a rich chalk grassland flora which includes several plants of nationally restricted distribution. Marsh fritillary and small heath butterflies have been recorded.
Non-Statutory Designated Sites and Nature Reserves of County or Local Value		
Luxenborough Banks CWS	Partly located within the proposed draft DCO site boundary.	Two small areas of remnant chalk grassland surrounded by arable reversion.
Countess Cutting CWS	Located within the proposed draft DCO site boundary.	Early-succession chalk grassland on a steep south-facing road cutting bank.
Countess Farm Swamp CWS	Located adjacent to the proposed draft DCO site boundary.	An area of derelict water meadow adjacent to the Salisbury Avon, with tall-herb, rank grassland, reedbed, poor fen and willow scrub.
Stonehenge Down CWS	Located 65m from the proposed draft DCO site boundary.	An area of level calcareous grassland.
Parsonage Down CWS	Partly located within the proposed draft DCO site boundary.	Part of the NNR which is outside (but immediately adjacent to) the SSSI boundary.
Woodhenge Verge CWS	Located within the proposed draft DCO site boundary.	An area of amenity grassland, designated for its calcareous grassland
Little Down CWS	Located adjacent to the proposed draft DCO site boundary.	An area of habitat designated for its calcareous grassland
Yarnbury Down CWS	Located adjacent to the proposed draft DCO site boundary.	An area of habitat designated for its calcareous grassland
Boscombe Down Railway Line CWS	Located 120m from the proposed draft DCO site boundary.	Two small areas of calcareous grassland

Designated Sites	Proximity to the proposed Scheme	Summary of reason for designation
Durrington Meadows CWS	Located 500m from the proposed draft DCO site boundary.	A group of derelict water meadows surrounded by old Willow pollards with a typical range of grassland and wetland habitats.
Vinies Farm Meadow CWS	Located 310m from the proposed draft DCO site boundary.	A small wet meadow by the River Avon.
Wilsford Manor Meadow CWS	Located 430m from the proposed draft DCO site boundary.	Species-rich fen meadow.
Cow Down CWS	Located 420m from the proposed draft DCO site boundary.	A forked coombe with unimproved calcareous grassland
Deptford Bank CWS	Located 300m from the proposed draft DCO site boundary.	A steep south- and west-facing bank with unimproved chalk grassland and large areas of dense scrub
Normanton Down RSPB Reserve	Located 225m from the proposed draft DCO site boundary.	Former arable conversion to chalk grassland being managed to encourage breeding stone curlews and other birds such as lapwing and corn bunting.

6.4.14 The study area lies mainly on rolling chalk downland, much of which is now open arable land in large fields. Within the arable landscape there are some extensive areas of chalk grassland, a priority habitat, notably at Yarnbury Castle and Parsonage Down, near the west end of the proposed Scheme, Beacon Hill near Bulford Camp and a southern extension of the Salisbury Plains SAC which lies at the edge of the study area beyond the east end of the proposed Scheme. There are also fields that have been re-seeded in recent years, to re-create chalk grassland around Stonehenge and at Normanton Down. In addition, there is open chalk grassland and developing scrub on some of the highway cuttings along the A303 near Amesbury. To the north of the high road and Diversion Route via Larkhill there are the very extensive grasslands and other habitats in the MOD training area on Salisbury Plain.

6.4.15 Woodland is present on the chalk downs, comprising broadleaved or mixed shelterbelts and other plantations of relatively recent origin. These woodlands are few in number and lack the principal habitat features of ancient woodlands or priority habitats. Although biological records indicate they do provide habitats for several species of bat. Additional woodland is located along the river valleys of the River Avon, especially at Amesbury Abbey adjacent to the proposed Scheme. The River Avon, a chalk river characterised by its aquatic vegetation is located at the east end of the proposed Scheme. It has a diversity of riverside habitats including swamp, fen, floodplain grassland, scrub and woodland. The River Till, including its adjacent floodplain pasture, is a typical winterbourne stream, flowing from north to south through the proposed Scheme. It flows in winter and spring, but dries during summer. There are relatively few hedges in this predominantly

open landscape, apart from a few in the valleys and along roadsides or farm tracks.

- 6.4.16 Protected species recorded in the study area include a range of bat species, badger (*Meles meles*) and great crested newt (*Triturus cristatus*), as well as those mentioned in Table 6.154 as interest features of the designated sites. The ecology baseline surveys undertaken to inform the ecological assessment are listed in paragraph 6.4.28 below.

Value of the Environmental Resources and Receptors

- 6.4.17 The designated sites are assigned value in the appropriate geographic context, in accordance with the Highways Agency Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment (HA IAN 130/10) (Ref 70). International value is assigned to the River Avon SAC and Salisbury Plain SAC; national value to the River Avon SSSI, River Till SSSI and Parsonage Down SSSI/NNR and county or local value to the CWSS. Normanton Down RSPB Reserve is of value in a county context due to the habitats provided for important bird species such as the stone curlew which is also a qualifying feature of the nearby Salisbury Plain SPA. The importance of habitats and populations of species occurring within the designated sites and other areas potentially affected by the proposed Scheme will be evaluated in the ES.

Potential Impacts and Mitigation

- 6.4.18 The proposed Scheme has the potential to have indirect effects on the ecological integrity of the River Avon SAC, where it would pass over the River Till on a new viaduct and over the River Avon on an existing bridge. No direct loss of habitat is anticipated within the River Avon SAC although there will be temporary habitat loss within the floodplain of the River Till (outside the SAC boundaries) with the possibility of a temporary bridge over the River Till for a haul road. After construction there would be potential indirect effects on vegetation within the SAC under the viaduct due to its shading influence. Additional indirect effects are possible through disturbance events such as pollution, siltation from water run-off and noise/vibration.
- 6.4.19 The proposed Scheme has the potential to have indirect effects on the ecological integrity of the Salisbury Plain SAC and SPA in two areas, namely an area to the west of the proposed Scheme within Parsonage Down and an area to the far east of the proposed Scheme near Bulford camp. The realignment of the A303 will take the road closer to the section of the Salisbury Plain SAC within Parsonage Down, potentially increasing the impacts of air pollution and disturbance during operation and construction. No construction works are anticipated to the eastern section near Bulford camp apart from small changes to the existing junctions, which would alter local traffic flow and the potential for increases or decreases of nitrogen oxides on vegetation will be assessed after air quality modelling.
- 6.4.20 The proposed Scheme has the potential to have indirect effects from shading on the ecological integrity of the River Till SSSI, which is part of the River Avon SAC, as mentioned above. There would be no direct effects on the River Avon SSSI, as the crossing would be on an existing bridge. Potential indirect impacts include pollution / siltation from water run-off.

- 6.4.21 The proposed Scheme has the potential for indirect effects on the ecological integrity of Parsonage Down SSSI and NNR and Yarnbury Castle SSSI. The road alignment will be moved closer to Parsonage Down SSSI and NNR therefore impacts from noise disturbance and air pollution during construction and operation may be possible. In relation to Yarnbury Castle SSSI, the section of A303 that runs past it is already duelled so an increase in disturbance is not anticipated however, due to its proximity to the Scheme (65m from the proposed draft DCO site boundary) there may still be effects related to increases in air pollution.
- 6.4.22 The proposed Scheme has the potential for direct effects on the ecological integrity of six county designated CWSs crossed by the proposed Scheme and potentially indirectly affect the ecological integrity of a further eight CWSs from impacts of disturbance (see Table 6.15). Normanton Down RSPB reserve could also be indirectly affected by disturbance of birds. Stone curlews are readily disturbed by increased human activity, especially by people with dogs. Hence the benefit of improved connectivity for people on foot in the section with the tunnel has the potential for indirect impacts of disturbance.
- 6.4.23 Potential mitigation for effects on the sites of nature conservation value includes, but is not limited to:
- a) minimising the land required for construction of the River Till crossing;
 - b) avoiding loss of habitat outside the highway boundary at the crossing of the River Avon;
 - c) drainage design to avoid risk of pollution;
 - d) proposed Scheme design and landscaping to provide mitigation for indirect effects of disturbance; and
 - e) avoiding or minimising the effects of severance, through habitat creation to link and extend existing areas of habitat.
- 6.4.24 There is potential for benefits/enhancement from:
- a) reducing existing severance and disturbance effects, by provision of a tunnel; and
 - b) by increasing the extent of chalk grassland and its connectivity to other areas in the ecological network by converting part of the existing A303 to a green lane.

Proposed Level and Scope of Assessment

- 6.4.25 A more detailed assessment of effects on biodiversity would be undertaken as part of the EIA, due to the potential for significant effects on the nature conservation value of the habitats and species within the proposed draft DCO site boundary and adjacent land.
- 6.4.26 As part of the EIA, further assessment will be undertaken to determine potential effects (both direct, indirect) on any statutory and non-statutory designated sites

from the route alignment. Appropriate zones of influence will be applied to the proposed Scheme, suggested to be a minimum of 2km for statutory sites and 5km for SACs designated for bats. SSSI impact risk zones and SAC consultation zones will also be considered.

- 6.4.27 Protected species records will be acquired from WSBRC for the study area. These records will be mapped to determine potential effects and to identify habitats which may support protected species and those that may be functionally connected. Priority habitats and priority species data –listed under Section 41 of the Natural Environment Communities Act 2006 as provided by WSBRC, will be included for the study area of the proposed Scheme.
- 6.4.28 Based on information from the desk study, the need for additional ecological surveys was identified. All the surveys were started in late 2016 or in 2017 in the seasonal period appropriate to the type of survey. The surveys are outlined in Table 6.15 below.

Table 6.15: Ecological Surveys

Survey Target	Survey Type	Description
Habitat	Phase 1 Habitat Survey	Undertaken from Public Rights of Ways (PROWs)
	River Habitat Survey	Of core areas of the River Till and River Avon
Botany	National Vegetation Classification (NVC)	Of targeted habitats following Phase 1 Habitat Survey
	Scarce arable flora,	Incorporated within NVC remit
	Aquatic macrophytes	Walkover survey along the river banks of core areas of the River Avon and River Till.
	Lichen	Surveys of the Stonehenge stones
Invertebrates	Terrestrial invertebrates	Survey focusing on marsh fritillary and general terrestrial invertebrates in suitable habitats
	Aquatic invertebrates	Surveys at six sample locations on the River Till and River Avon, 1km upstream and 2km downstream of the crossings
	Desmoulin's whorl snail	Survey focussing on river margins and associated floodplains of the River Till and River Avon, 2km upstream of Winterbourne Stoke on the River Till, 1.5km upstream on the River Avon and 6km downstream from Amesbury.
	White-clawed crayfish (<i>Austropotamobius pallipes</i>)	Survey focussing on the core areas within the River Till and the River Avon
Fish	Fish	Survey of six 500m reaches within core areas of the River Till and River Avon
Reptiles	Reptiles	Habitat appraisal and ad hoc records recording during other surveys (in addition to previous surveys from desk study)

Survey Target	Survey Type	Description
Amphibians	Great crested newt	Re-survey of sites identified historically through eDNA survey. Including habitat suitability assessment, presence/absence surveys and population size class assessment for ponds with confirmed presence.
Birds	Common Bird Census (CBC) (breeding) surveys	Transects within representative habitats
	Quail (<i>Coturnix coturnix</i>)	Surveys within suitable habitats
Mammals	Badger	Surveys within suitable habitats
	Bats	Including: tree/structure inspections, emergence/re-entry surveys, activity transects and passive monitoring and trapping/radio-tracking
	Otter (<i>Lutra lutra</i>)	Survey along the River Till and River Avon.
	Water vole (<i>Arvicola amphibius</i>)	Survey along the River Till and River Avon.
	Hazel dormouse (<i>Muscardinus avellanarius</i>)	Deployment of survey nest tubes and nest boxes to sites surveyed historically (e.g. Normanton Copse, Longbarrow Copse, Mile Long Hedgerow), as well as additional sites (e.g. Vespasian Camp woodland and Amesbury Abbey woodland). With ongoing monitoring

6.4.29 Additional baseline surveys were scoped out for two topics:

- a) reptiles (other than habitat appraisal); and
- b) wintering birds.

6.4.30 Further baseline surveys would not be needed for reptiles and wintering birds, because there is already sufficient information to inform the ecological assessment. For reptiles, the desk study information from previous reptile surveys confirmed the presence of three common species of reptiles: common lizard (*Lacerta vivipara*), slow worm (*Anguis fragilis*) and grass snake (*Natrix natrix*) in suitable semi-natural habitats crossed by or adjacent to the proposed Scheme. An appraisal of habitat suitability in 2017 indicated that habitats were similar to previous surveys, or in some cases less suitable due to agricultural use. Previous surveys had shown that the populations of reptiles were widespread, but at low abundance and this situation is expected to be similar at present, based on the habitat appraisal. Mitigation will be included as part of the proposed Scheme. Natural England was consulted about this and agreed that additional reptile survey would not be required for the ecological assessment. For wintering birds, including hen harrier, the requirement for survey was scoped out following consultation with the Royal Society for the Protection of Birds (RSPB) and the Wiltshire Ornithological Society raptor group, as these stakeholders monitor populations locally.

6.4.31 The baseline habitat and protected species surveys are being undertaken, or have been completed recently, to provide additional data to inform the ecological

assessment in the PEI Report and ES. The results of these surveys have not yet been released, but will be included and evaluated within the PEI Report.

- 6.4.32 Consultation with key stakeholders is currently underway and will continue during the work toward the PEI Report and ES. Consultation to date includes a meeting with Natural England and RSPB in relation to habitat creation opportunities, a meeting with Natural England to discuss proposed Scheme design development and another to discuss scope for habitat creation at Parsonage Down NNR. A Stakeholder Engagement strategy is in place (see sections 4.2 and 4.3) with meetings proposed with an Environment Stakeholder group.
- 6.4.33 The PEI Report will inform the Habitat Regulation Assessment (HRA), the ES and European Protected Species (EPS) mitigation licences prepared in draft for advisory comment from Natural England, all of which will form part of the Development Consent Order (DCO) application for the proposed Scheme.

Assessment Methodology

- 6.4.34 The proposed Scheme could affect an internationally designated site and therefore likely significant effects will be considered through a formal HRA process, in accordance with DMRB Section 4, Part 1, Assessment of the Implications on European Sites (Ref 134). Early consultation with Natural England is currently being undertaken to inform this and to identify opportunities for enhancement. There have been several meetings and calls to date.
- 6.4.35 The assessment of impacts and significance to inform the ES will follow the Highways Agency Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment (Ref 70), which supplements the earlier DMRB chapter in Volume 11, Section 3, Part 4 'Ecology and Nature Conservation' (dated 1993) (Ref 71). These guidelines set out a process of identifying the value of ecological receptors, characterising the impacts that are predicted and the mitigation measures required, and assessing the significance of the effects of the residual impacts. The guidance on ecological assessment by CIEEM (2016) (Ref 68) will be used to help evaluate sites, habitats and species and to assess the effects on ecological integrity to help apply the DMRB method in accordance with best practice.
- 6.4.36 The mitigation hierarchy will be applied as part of the impact assessment. Best practice ecological mitigation principles will be taken into account as part of the assessment, and will include initial consideration of design mitigation, habitat creation and habitat management. Opportunities for benefits/enhancement of biodiversity will also be considered. Recommendations for monitoring will be made where appropriate, to inform future management and the body of evidence Assumptions, Limitations and Uncertainties

This report is based on a high level desk-based assessment with a number of unfixed design elements and limited recent information from baseline surveys. At this scoping stage there is some uncertainty about the ecological receptors until completion of the baseline survey. However, there is sufficient information to scope the potential receptors and impacts. The iterative process of the design development and the detailed surveys currently being undertaken will progressively reduce these uncertainties. The information gained will be used to

fully inform the PEI Report, ES and Draft EPS licences that will form part of the DCO application for the proposed Scheme.

6.5 Noise and Vibration

Introduction

- 6.5.1 The assessment will consider permanent impacts due to operational road traffic noise and vibration; and temporary noise and vibration impacts during the construction phase.
- 6.5.2 Impacts will be assessed at sensitive receptors, such as residential properties, community facilities and scheduled monuments, including the WHS.
- 6.5.3 Impacts on quiet areas and tranquillity will be considered as part of the landscape and visual effects assessment, and impacts on ecologically sensitive receptors will be considered as part of the biodiversity assessment based on data produced as part of the noise and vibration assessment.

Study Area

- 6.5.4 The study area will be defined in accordance with guidance given in Highways England's Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, HD 213/11 Revision 1 (Ref 129).
- 6.5.5 The study area for the quantitative assessment of construction phase noise and vibration impacts will focus on the closest identified receptors to the various works.
- 6.5.6 The study area for the assessment of operational phase noise impacts has been defined as outlined below, following the guidance set out within DMRB:
 - a) The study area comprises the proposed Scheme, the existing A303 replaced by the scheme and all surrounding existing roads that are predicted to be subject to a change in traffic noise level as a result of the proposed Scheme of:
 - i. 1dB(A) or more in the short term (Do-Minimum (DM) opening year to Do-Something (DS) opening year); or
 - ii. 3dB or more in the long term (DM opening year to DS 15 years after opening), subject to a minimum change of 1dB between the DM and DS 15 years after opening.
 - iii. These roads are defined as 'affected routes' and are identified by analysis of the traffic data. The identification of affected routes will consider all roads with 18hr (06:00-00:00) weekday traffic flows above the 1,000 lower cut off of the Calculation of Road Traffic Noise (CRTN) prediction methodology in all scenarios;
 - b) The study area for the detailed quantitative assessment of noise impacts comprises a 0.37 mile (600m) calculation area corridor either side of the Scheme carriageway, 0.37miles (600m) either side of the existing A303 carriageway replaced by the Scheme, and 0.37miles (600m) either side of

all affected routes within a 0.62mile (1km) boundary around the Scheme and existing A303 replaced by the Scheme;

- c) For residential properties and other sensitive receptors that are within the 0.62mile (1km) boundary around the Scheme and the existing A303 replaced by the Scheme, but more than 0.37miles (600m) from an affected route, the Scheme or existing A303 replaced by the Scheme, a qualitative assessment of the traffic noise impacts will be carried out; and
- d) For affected routes which are outside the 0.62mile (1km) boundary around the Scheme and existing A303 replaced by the Scheme, an assessment will be undertaken by estimating the CRTN Basic Noise Level (BNL) for these routes with and without the Scheme. A count of the number of dwellings and other sensitive receptors within 0.03miles (50m) of these routes will be undertaken.

6.5.7 The study area for the assessment of operational phase airborne vibration annoyance impacts is defined, in accordance with DMRB, as 0.02miles (40m) from the above ground sections of the Scheme and the existing A303 replaced by the Scheme.

6.5.8 The proposed Scheme is likely to include some minor works to existing roads outside the scheme extents on the A303, for example, at the Rolleston Cross junction north of the A303. For the purposes of defining the study area as set out above, any such works will be included in the study area definition.

Planning Policy Context

6.5.9 The following planning guidance and legislation have been taken into account as part of identifying the assessment methodology, receptor selection/sensitivity, potential significant environmental effects; and mitigation:

- a) National Policy Statement for National Networks (Ref 3);
- b) National Planning Policy Framework (Ref 8);
- c) Noise Policy Statement for England (Ref 135); and
- d) Web-based resource “Planning Practice Guidance on Noise” (PPG-N) (Ref 136).

6.5.10 The aims in the National Policy Statement for National Networks (NPSNN) provide the guiding principles for the consideration of mitigation of the impacts of the proposed Scheme, within the context of sustainable development:

- a) avoid significant adverse impacts on health and quality of life from noise as a result of the new development;
- b) minimise and mitigate other adverse impacts on health and quality of life from noise from the new development; and
- c) contribute to improvements to health and quality of life through the effective management and control of noise, where possible.

- 6.5.11 These aims are echoed in the NPPF.
- 6.5.12 The scope of the assessment is informed by the NPSNN in terms of the requirement to consider both construction and operational impacts, and the impacts on quality of life, areas of high landscape value and biodiversity. The NPSNN also informs the assessment methodology through the requirement to follow the principles of the relevant British Standards and other guidance.
- 6.5.13 The Explanatory Note to the NSPE informs the assessment methodology in terms of the guidance on 'adverse impacts' and 'significant adverse impacts' through the introduction of the following concepts:
- a) No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
 - b) Lowest Observable Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
 - c) Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.
- 6.5.14 The NPSE recognises that 'it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations'. The levels are likely to be different for different noise sources, for different receptors and at different times of the day, therefore the assessment methodology outlines the proposed LOAEL and SOAEL for each potential impact. The setting of these levels has been informed by the additional guidance in the Planning Practice Guidance on Noise (PPG-N) (Ref 136).

Baseline Conditions

- 6.5.15 The study area is predominantly rural in nature. Road traffic noise from the existing A303 is a readily appreciable impact that affects the setting of the Stonehenge WHS. Other sources of road traffic noise include the A360 and A345. The existing A303 passes close to residential properties at Winterbourne Stoke, and the A345 runs through Amesbury and adjacent to Larkhill and Durrington.
- 6.5.16 The area is subject to occasional noise from light aircraft, military aircraft and other military activities.
- 6.5.17 Under the Environmental Noise Directive (END) (Ref 72) strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England, including the A303. Five 'Noise Important Areas' (those areas most exposed to noise) were identified in round 2 in the vicinity of the Scheme. The two Noise Important Areas on the A303 in Winterbourne Stoke are the responsibility of Highways England and mitigation will be considered as part of the Scheme. The three Noise Important Areas in Amesbury are the responsibility of the local Highways Authority, though the impact on these areas will be considered as part of the Scheme assessment.

- 6.5.18 A baseline noise survey at a selection of locations along the proposed route is proposed to be carried out as part of the assessment. The results will be used to characterise the noise climate in the area and verify the results predicted by the traffic noise model are reasonable. A weather station installed at one of the monitoring locations will record weather conditions throughout the baseline survey. Baseline vibration monitoring is also proposed at selected locations in the vicinity of the tunnelled section of the proposed Scheme.

Potential Effects and Mitigation

Construction Effects

- 6.5.19 The main construction activities that are likely to take place are site clearance, earthworks, retaining wall construction and road construction works, as well as the construction of bridges and the tunnel structure.
- 6.5.20 The construction of the scheme has the potential to result in temporary noise impacts at the closest receptors to the works. The magnitude of construction noise impacts is dependent on the nature of the proposed construction works and the proximity of sensitive receptors. The significance of the effect is dependent on a number of factors including the magnitude of the impact, the sensitivity of the receptor, the timing of the works (day/night) and duration of the impact. Industry standard construction noise mitigation measures will be identified, and the likely need for specific additional measures, such as solid hoarding around specific activities, will be determined.
- 6.5.21 The potential for temporary construction vibration impacts is dependent on the need for construction works activities which are a potentially significant source of vibration, such as tunnelling, impact piling or ground improvement works using vibratory rollers. The method of tunnel construction and the need for piling or ground improvements works has not yet been determined. The assessment of the magnitude of construction vibration impacts will consider both annoyance to occupiers of sensitive receptors and structural impacts. Construction vibration impacts on residential properties, other non-residential sensitive buildings, and heritage features will be considered. If potential vibration impacts are identified as part of the assessment, potential mitigation measures will be identified.
- 6.5.22 Construction traffic can have a temporary impact on sensitive receptors located along existing roads used by these vehicles. The potential for such impacts is dependent on the volume and route of construction traffic. At this stage no details on construction traffic are available, therefore as a precautionary approach construction traffic noise impacts are scoped into the EIA. This will be reviewed as more detailed information becomes available. If no changes in traffic noise level of 1dB or more are likely due to construction traffic then no further assessment is proposed.
- 6.5.23 An assessment of the sensitivity of road links to accommodate planned diversions during any night-time road closures will be undertaken, dependent on the assumed number of night-time closures and the disposition of sensitive receptors adjacent to the diversion route.

Operational Effects

- 6.5.24 The operation of the proposed Scheme has the potential to result in both beneficial and adverse permanent traffic noise impacts. The proposed Scheme brings the road closer to some receptors, and further away from others. The relocation of the road into a tunnel will significantly reduce operational traffic noise levels along the tunnelled section past Stonehenge.
- 6.5.25 The magnitude of the operational traffic noise impact at a receptor is dependent on a range of factors including the traffic flow, composition, speed, road surface, ground topography, the presence of intervening buildings/structures and the distance to the road. The alleviation of congestion on the A303, resulting in an increase in traffic speeds and flows can result in increases in traffic noise levels. The significance of the effect is dependent on a number of factors, including the magnitude of the impact and the sensitivity of the receptor.
- 6.5.26 Noise reduction measures are being incorporated into the design of the proposed Scheme by means of the vertical and horizontal alignment and through the proposed use of low noise surfacing. The need for further measures, such as noise barriers, will be determined as part of the assessment and in conjunction with other environmental disciplines, to avoid secondary impacts (including, for example, upon landscape and visual and cultural heritage features).
- 6.5.27 No specific traffic noise assessments are proposed of the operation of the diversion route, for instances when the tunnel is closed, or the amended 'High Load' route, due to the very limited frequency of closure events and use for diversion.

Assessment Methodology

Construction

- 6.5.28 A quantitative assessment of construction noise impacts will be undertaken. Estimates of typical construction noise levels will be made for a selection of the closest identified receptors to the works in accordance with the methodology in BS 5228: 2009+A1: 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' (Ref 73). These will be based on specific construction information including the number and type of plant required for each activity, typical 'on' times for each item of plant, working areas, working times and durations.
- 6.5.29 BS 5228 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. Taking into account this guidance the threshold values detailed in Table 6.16 will be adopted for the EIA to define the SOAEL (the 'significant observed adverse effect level') and the LOAEL (the 'lowest observable adverse effect level') for residential receptors.

Table 6.16: Construction Noise SOAEL and LOAEL for residential receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	75	65

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	65	55
Night-time (23:00 – 07:00)	55	45

- 6.5.30 The criterion for the SOAEL at residential receptors corresponds to the threshold values for Category C in the BS 5228 example ABC method. Similarly, the criterion for the LOAEL corresponds to the threshold values for Category A in the BS 5228 example ABC method. In accordance with the NPPF and NPSE, it is important to consider receptors that exceed the LOAEL and ensure adverse effects are mitigated and minimised.
- 6.5.31 The magnitude of the impact of construction noise on residential receptors will be classified in accordance with the descriptors in Table 6.17.
- 6.5.32 The magnitude of the impact at non-residential receptors, such as community facilities, will be assessed as required based on their use.

Table 6.17: Construction Noise magnitude of impact criteria for residential receptors

Magnitude of Impact	Daytime $L_{Aeq,T}$ dB (façade)	Evening / Weekend $L_{Aeq,T}$ dB (façade)	Night-time $L_{Aeq,T}$ dB (façade)
Major	> 80	> 70	> 60
Moderate	>75-80	>65-70	>55-60
Minor	>65-75	>55-65	>45-55
Negligible	≤ 65	≤ 55	≤ 45

- 6.5.33 When identifying potentially significant effects exceedances of the impact criteria and other project-specific factors, such as the existing ambient noise levels, the number of receptors affected, and the frequency and duration of the impact, will be taken into account.
- 6.5.34 Construction traffic noise impacts along existing roads will be assessed based on the calculation of the CRTN BNL (Basic Noise Level at a reference distance of 10 metres from the nearside carriageway), both with and without the construction traffic, for each affected road link. The magnitude of the impact of construction traffic will be assigned based on the anticipated change in traffic noise level, in accordance with the same criteria as used for short term operational road traffic noise impacts, as detailed in Table 6.18.

Table 6.18: Magnitude of Construction Traffic Noise Impacts

Noise Level Change (rounded to 0.1dB) $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor

3 – 4.9	Moderate
5+	Major

- 6.5.35 Construction vibration impacts will be assessed for any construction activities which are a potentially significant source of vibration (for example, tunnelling, impact piling, use of vibratory rollers etc.) proposed in close proximity of any identified sensitive receptors.
- 6.5.36 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228 provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings and annoyance to occupiers.
- 6.5.37 Table 6.19 details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors, based on guidance contained in BS 5228.

Table 6.19: Construction Vibration magnitude of impact criteria for human receptors (Annoyance)

Peak Particle Velocity Level	Description	Magnitude of Impact
$\geq 10\text{mms}^{-1}$	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major
1.0 to $< 10\text{mms}^{-1}$	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Moderate
0.3 to $< 1\text{mms}^{-1}$	Vibration might be just perceptible in residential environments.	Minor
0.14 to $< 0.3\text{mms}^{-1}$	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible

- 6.5.38 For human receptors the LOAEL will be defined as a PPV of 0.3mms^{-1} (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL will be defined as a PPV of 1.0mms^{-1} , this being the level at which construction vibration can be tolerated with prior warning.
- 6.5.39 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels within buildings are controlled to those relating to annoyance (i.e. 1.0mms^{-1}), then it is highly unlikely that buildings will be damaged by construction vibration levels.

- 6.5.40 The criteria proposed for this assessment relate to the potential for cosmetic damage and structural damage.
- 6.5.41 BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration' (Ref 74) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228. Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 6.20.

Table 6.20: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mms ⁻¹ at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15mms ⁻¹ at 4Hz increasing to 20mms ⁻¹ at 15Hz	20 mms ⁻¹ at 15Hz increasing to 50mms ⁻¹ at 40Hz and above
NOTE 1: Values referred to are at the base of the building. NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

- 6.5.42 BS 7385-2:1993 states that the probability of building damage tends towards zero for transient vibration levels less than 12.5mms⁻¹ PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.
- 6.5.43 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 'Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures' (Ref 75) defines three different categories of building damage:
- cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
 - minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
 - major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.
- 6.5.44 BS 7385-2:1993 defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in Table 6.21 below for continuous vibration.

Table 6.21: Construction Vibration magnitude of impact criteria for assessing building damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mms ⁻¹
Major	Major	30

Moderate	Minor	15
Minor	Cosmetic	6
Negligible	Negligible	<6

- 6.5.45 With regard to construction vibration impacts on heritage assets, such as Stonehenge, the impact will be assessed as required based on their sensitivity and applicable criteria for damage. Prevailing ground borne vibration levels to Stonehenge will be monitored during the baseline noise and vibration survey, the results of which will feed into this assessment.

Operation

- 6.5.46 The general principle of DMRB is to allocate an assessment method according to risk - this process uses three levels of assessment: Scoping, Simple and Detailed. The assessment approach proposed for this scheme is the most comprehensive Detailed assessment.
- 6.5.47 Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of heavy goods vehicles (HGV)), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.
- 6.5.48 Noise from a stream of traffic is not constant, but to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in CRTN to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean. As recorded in DMRB, a reasonably good correlation has been shown to exist between this index and the perception of traffic noise by residents over a wide range of noise exposures.
- 6.5.49 CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level. Noise levels are predicted at a point measured 1m horizontally from the external façade of buildings.
- 6.5.50 Although the main focus of the assessment is on daytime impacts, DMRB also requires an assessment of night-time (i.e. between 23:00 and 07:00) traffic noise levels (L_{night} , outside). However, this parameter is not calculated by the standard CRTN methodology. DMRB refers to three methods for calculating night-time traffic noise levels developed by the Transport Research Laboratory (TRL) (Ref 76). The most widely used is 'Method 3' which factors the L_{night} from the $L_{A10, 18h}$, based on the typical diurnal pattern of traffic flows in the UK. This method has been used in the noise assessment work of the various options at the previous stages. However, for the detailed assessment of the proposed Scheme it is proposed to improve on this approach.
- 6.5.51 One of the aims of the proposed Scheme is to alleviate congestion during the day, at night, congestion is unlikely to be a problem, and therefore the changes in traffic noise levels are likely to be smaller at night than during the day. To more

accurately represent the change to night-time traffic noise levels a method based directly on night-time traffic conditions, rather than simply factoring the daytime traffic noise levels is proposed.

- 6.5.52 A hybrid of the DMRB 'Method 1' (based on individual hourly flows) and 'Method 2' (based on 8 hour night time flows) is proposed to assess potential night-time traffic noise impacts. The 8 hour night-time traffic flow from the traffic model will be used to determine a typical 1 hour flow during the night and the Method 1 prediction method applied. This approach has been adopted successfully on previous schemes, where one of the main aims is to alleviate daytime congestion, as an improvement on the more simple 'Method 3'. A -2.5 dB correction is applied to the night-time predicted traffic noise levels, to convert from façade to free-field levels i.e. noise levels which are unaffected by reflecting surfaces other than the ground (as advised in CRTN).
- 6.5.53 Predicted daytime and night-time traffic noise levels will be generated using noise modelling software. The model will be based on traffic data generated by a traffic model of the proposed Scheme and surrounding area. The traffic flow and % HGV data are taken directly from the model. However, the traffic speeds are subject to a process called 'speed banding' which assigns one of four speeds to all non-motorway roads. The model also includes the ground topography, ground type and buildings to form a 3D representation of the study area.
- 6.5.54 Once the traffic noise levels have been predicted, they can be used to provide an indication of the magnitude of the impact at each receptor and the likely annoyance to residents caused by traffic noise, in both the short and long term. Individuals vary widely in their response to the same level of traffic noise. However, the average or community response from a large number of people to the same level of traffic noise is fairly stable and, therefore, a community average degree of annoyance caused by traffic noise can be related to the long-term steady state noise level. In addition, DMRB notes that people are more sensitive to abrupt changes in traffic noise, for example, following the opening of a new road, than would be predicted from the steady state relationship between traffic noise and annoyance (as described above). These effects last for a number of years. However, in the longer term, the perceived noise annoyance tends towards the steady-state level due to familiarisation.
- 6.5.55 The objective of the assessment, as set out in DMRB, is to gain an overall appreciation of the noise and vibration climate, both with (Do-Something (DS)) and without (Do-Minimum (DM)) the proposed Scheme, to identify where noise impacts occur and to determine where mitigation to reduce these impacts may be appropriate. These conditions are assessed for the baseline year (the year of opening) and the future assessment year (15 years after opening).
- 6.5.56 DMRB outlines the steps to be carried out at the Detailed assessment stage which are proposed to be followed for this assessment:
- a) Identify the study area (see Section 12.1.3) and predict 18-hour (06:00 - 00:00) and night-time (23:00 - 07:00) traffic noise levels at all residential properties within the 600 m calculation area for all assessment scenarios.

- b) Carry out the following comparisons for each property in order to identify the number of properties where residents may experience an increase or decrease in traffic noise levels and annoyance:
 - i. The Do-Minimum scenario in the baseline year against the Do-Minimum scenario in the future assessment year (long-term);
 - ii. The Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short-term); and
 - iii. The Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long-term).
- c) For night-time traffic noise levels, undertake comparisons for the two long-term scenarios and for properties where the $L_{night,outside}$ level is 55 dB(A) or more in the relevant scenarios;
- d) Assess the impact on sensitive receptors, other than residential properties, within the 0.37mile (600m) calculation area. This is based on 18 hour (06:00 - 00:00) traffic noise levels and considers the same three comparisons as outlined in (b) above for residential properties;
- e) Complete a qualitative assessment of sensitive receptors which are within the 0.62 mile (1km) boundary, but outside the 0.37mile (600m) calculation area; and
- f) For affected routes which are outside the 0.62mile 1km boundary, complete an assessment by estimating the CRTN BNL on these roads (the traffic noise level at 10m) with and without the proposed scheme. Count the number of dwellings and other sensitive receptors within 0.03mile (50m) of these routes.

6.5.57 Different façades of the same property can experience different changes in traffic noise level depending on their orientation to the noise source. DMRB requires that each of the above comparisons of traffic noise levels is based on the façade which experiences the least beneficial change i.e. the largest increase, or, if all façades undergo a decrease, the smallest decrease. Additionally, DMRB requires that the above comparisons of annoyance use the highest levels of annoyance in the first 15 years. For properties which experience an increase in noise due to the proposed Scheme, the greatest annoyance is likely to be immediately after the Scheme opening. For properties which experience a decrease in noise (and also in the Do-Minimum comparison), the greatest annoyance is the steady-state level of annoyance in the long term.

6.5.58 DMRB provides two example classifications for the magnitude of the traffic noise impact of a proposed road scheme, as shown in Table 6.22. These relate to short-term changes in noise levels and long-term changes in noise levels. The classifications detailed in Table 6.22 are proposed to be used in the assessment of the Preferred Route.

Table 6.22: Magnitude of Traffic Noise Impacts

Short Term Change		Long Term Change	
Noise Level Change (rounded to 0.1dB) $L_{A10,18h}$ dB	Magnitude of Impact	Noise Level Change (rounded to 0.1dB) $L_{A10,18h}$ dB	Magnitude of Impact
0	No change	0	No change
0.1 – 0.9	Negligible	0.1 – 2.9	Negligible
1 – 2.9	Minor	3 – 4.9	Minor
3 – 4.9	Moderate	5 – 9.9	Moderate
5+	Major	10 +	Major

- 6.5.59 The introduction of guidance set out within the NPPF, NPSNN and NPSE has increased the focus on consideration of absolute noise levels as well as the change in noise levels due to a road scheme. The current version of DMRB only considers the change in noise level when determining the magnitude of impact of a road scheme. In light of the introduction of guidance set out within the NPPF, NPSNN and NPSE a greater consideration of absolute noise levels is considered appropriate, including an acknowledgement that where existing traffic noise levels are high (above the SOAEL as defined below), even small changes in traffic noise in the short term, on road scheme opening (1dB or more), may be significant.
- 6.5.60 With respect to absolute road traffic noise levels, for daytime, the SOAEL for residential properties is set at 63dB $L_{Aeq,16h}$ (free field). This is equivalent to 67.5dB $L_{A10,18h}$ (façade), which is consistent with the daytime trigger level in the Noise Insulation Regulations. The LOAEL is set at 50dB $L_{Aeq,16h}$ (free field), based on the information provided in the Guidelines for Community Noise (Ref 77).
- 6.5.61 For night-time, the SOAEL for residential properties is set at 55dB $L_{Aeq,8h}$ (free field) for residential properties. This aligns with the interim night-time outdoor target level provided in the Night Noise Guidelines for Europe (Ref 78). The LOAEL is set at 40dB $L_{Aeq,8h}$ (free field), which is defined as the LOAEL for night time noise in the Night Noise Guidelines for Europe.
- 6.5.62 With regard to absolute traffic noise levels in the WHS, the approach adopted at previous stages of the scheme assessment will be retained. This is based on the extent of the WHS which falls within 50dB $L_{Aeq,16h}$ (free-field) in each assessment scenario.
- 6.5.63 The operational assessment will be based on annual average traffic conditions. During the summer months traffic flows on the A303 can be considerably higher. It is proposed to undertake a sensitivity analysis of the likely magnitude of the increase in daytime traffic noise levels during the summer based on traffic data for the summer months.
- 6.5.64 Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range of 50 - 100Hz. Ground borne vibration is produced by the interaction of the vehicle tyres and the road surface with dominant frequencies typically in the range of 8 - 20Hz. The passage of

vehicles over irregularities in the road surface can also be a source of ground borne vibration.

- 6.5.65 Traffic vibration can potentially affect buildings and disturb occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage.
- 6.5.66 Airborne vibration is noticed by occupiers more often than ground borne vibration, as it may result in detectable vibrations in building elements such as windows and doors.
- 6.5.67 DMRB states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances.
- 6.5.68 It is a requirement of new highway constructions that the highway surface be smooth and free from any discontinuities. Paragraph A5.25 of DMRB highlights that in relation to ground borne vibration “no evidence has been found to support the theory that traffic induced vibrations are a source of significant damage to buildings”. Paragraph A5.26 of DMRB also states: “Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances”. Hence, no significant effects from traffic induced ground borne vibration due to the passage of vehicles over irregularities on the Preferred Route, in terms of either disturbance or damage to buildings (and other structures such as Stonehenge which is over 200m from the proposed Scheme) are anticipated and no further assessment is proposed. To assess the magnitude of the impact of traffic induced airborne vibration on residents, a parameter is needed which reflects a person’s subjective rating of vibration disturbance. DMRB recommends the use of the $L_{A10,18h}$. The relationship between the $L_{A10,18h}$ and annoyance due to vibration is similar to that for annoyance due to steady state traffic noise, except that the percentage of people bothered by vibration is lower. For a given level of noise exposure, the percentage of people bothered very much or quite a lot by vibration is 10% lower than the corresponding figure for annoyance due to traffic noise. Below 58dB(A) the percentage of people bothered by traffic induced vibration is assumed to be zero.
- 6.5.69 The potential for vibration impacts is limited to the immediate vicinity of a road, and the relationship between annoyance due to vibration and traffic noise level in DMRB is based on properties located within 0.02miles (40m) of a road. Therefore, at each property within 0.02miles (40m) of the Preferred Route and/or the existing A303 replaced by the Preferred Route, and at which traffic noise levels are predicted to be 58dB, $L_{A10,18h}$ or more, the percentage of people likely to be bothered very much or quite a lot by vibration will be calculated.

Significance of Effect

- 6.5.70 The significance of effect is primarily a function of the value or sensitivity of the receptor and the magnitude of the impact. DMRB Volume 11, Section 3, Part 7, HD 213/11 Revision 1 states in paragraph 3.36 that “In terms of road traffic noise,

a methodology has not yet been developed to assign significance according to both the value of a resource and the magnitude of an impact". In the absence of specific guidance on assigning significance to operational traffic noise impacts, the approach outlined below for assigning significance has been adopted for all aspects of noise and vibration, including both construction and operation.

6.5.71 The value or sensitivity of the receptor and the magnitude of the impact (e.g. the noise change) is combined with professional judgement which takes into account a range of other factors including:

- a) the absolute noise levels e.g. are existing ambient levels already very high or very low;
- b) the characteristics of the existing noise environment
- c) the number of affected receptors;
- d) the duration of the impact; and
- e) for non-residential receptors' the nature, times of use and design of the receptor.

6.5.72 Table 6.23 presents the initial significance of effect, based on the predicted magnitude of impact and the sensitivity of receptors, after which the additional factors detailed above are applied to reach a conclusion on the significance of effect.

Table 6.23: Significance of Effect

Magnitude of impact	Value/ Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
Major	Very Large	Large	Moderate	Slight	Slight
Moderate	Large	Moderate	Moderate	Slight	Neutral
Minor	Moderate	Slight	Slight	Neutral	Neutral
Negligible	Slight	Slight	Slight	Neutral	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

6.5.73 With respect to the significance of effect outcomes from Table 6.23, neutral and slight adverse (or beneficial) effects are considered to be not significant, whereas moderate, large and very large adverse (or beneficial) effects are considered to be significant.

Assumptions, Limitations and Uncertainties

6.5.74 The potential for operational ground borne vibration impacts is related to the presence of irregularities in the road surface, which are not an issue with new road surfaces and are resolved by routine maintenance of existing roads. Therefore, in accordance with the guidance in DMRB, operational ground borne vibration impacts are scoped out of the assessment.

6.5.75 The construction noise and vibration impact assessment will be based on the best available information. As with all construction noise and vibration

assessments the exact details will not be available before a specific contractor is appointed to complete the works and determines their exact construction methods and programme.

6.6 Geology and Soils

Introduction

- 6.6.1 The geology and soils topic considers superficial (drift) and bedrock geology, structural and engineering geology, geological Sites of Special Scientific Interest (SSSI), Local Geological Sites (LGS), mineral resources, and land contamination.
- 6.6.2 General and topic-specific guidance presented within Volume 11 of the Design Manual for Roads and Bridges (Ref 82) have been used in preparation of this section.

Study Area

- 6.6.3 The study area for the geological and land contamination assessment comprises the proposed Scheme, which includes the proposed High Load Route and the Diversion Route and an additional radial zone of 250m. A radial zone of 0.62 miles (1 kilometre) has been considered for groundwater, surface water and potable water abstraction within the context of identifying potential receptors to any contamination. This is considered appropriate for the consideration of historical and current potentially contaminative land uses which may have resulted in contamination within the study area. For the remainder of the topic, the study area comprises the working area of the Scheme; since these remaining receptors (those identified other than groundwater and surface water receptors) are only likely to be impacted where the Scheme directly crosses or interfaces with them.
- 6.6.4 De-watering risk assessments will be undertaken to assess the potential for contaminants to mobilise should de-watering be required to facilitate construction or operations. It is anticipated that these risk assessments may take into account a larger study area, potentially up to 3.11 miles (5 kilometres) to encompass potential areas to be used for construction and the potential zone of influence on Water Framework Directive (WFD, 2000/60/EC) groundwater bodies and groundwater Source Protection Areas (SPZ) caused by dewatering required for construction, principally tunnelling and operational purposes. The de-watering zone of influence will likely be refined based on the results of future groundwater investigations. Further details are provided in Section 6.9 (Road Drainage and the Water Environment).

Planning Policy Context

- 6.6.5 The following planning policies have been taken into account as part of identifying the assessment methodology, receptor selection/sensitivity, potential significant environmental effects and mitigation:
 - a) National Policy Statement for National Networks (Ref 3) – paragraphs 5.117, 5.118 and 5.119 in relation to land instability and 5.168 in relation to land contamination;

- b) National Planning Policy Framework (Ref 8) –paragraphs 109, 110, 111, 117, 120 and 121 in relation to conserving and enhancing the natural environment; and
- c) Wiltshire Council Core Strategy Development Plan Document (Ref 7) – core policy 50 (geodiversity) and core policy 68 (water resources).

- 6.6.6 These policies identify the need for site specific land contamination/ground instability assessments. These are required to provide information on the level of risk to the natural and local environment from soil and water pollution or land instability that may be caused by both new, and existing, development. Should contaminated or unstable land be identified during assessments, the policies state that it is the responsibility of the developer, or landowner, to remediate and mitigate as appropriate to secure a safe development.
- 6.6.7 After remediation, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990 (Ref 79). Water resources must be protected throughout the construction and operational phases of development and the quality and quantity must be maintained and improved.
- 6.6.8 The National Planning Policy Framework (NPPF) Planning Practice Guidance sections on “land affected by contamination” and “land instability” have also been taken into account and provide further detail regarding the approach to assessing and managing land contamination and instability.

Baseline Conditions

Geology

- 6.6.9 Made Ground is not mapped within the Scheme study area. However, it is anticipated to be present in areas of previous and existing development and along existing highways. Available historical reports for previous phases of investigation and assessment indicate that occasional anthropogenic inclusions of brick, bitumen, concrete, tarmac, ash, clinker, geotextile and metal have been identified in Made Ground present at the existing Countess and Longbarrow roundabouts. Within the northern section of the Scheme (south of the eastbound carriageway of The Packway (road)), there are areas indicated by the British Geological Survey (BGS) as areas of “artificial ground”. Areas of “artificial land” are also shown associated with Larkhill, within 250 m of the proposed Scheme. There is also the potential for Made Ground associated with infilled ground. Based on information contained in the Groundsure report (Ref 84), it is known that there are chalk pits, gravel pits, ground workings, cuttings, covered reservoirs, and infilled ponds within the study area.
- 6.6.10 Localised superficial deposits are present underlying the proposed Scheme. River Terrace Deposits, Alluvium and Peat associated with the River Avon are present in the eastern part of the proposed Scheme alignment. Alluvium surrounds the channel of the River Till towards the west of the proposed Scheme. Head Deposits are present within the study area, typically following the dry valley bottoms associated with former/seasonal surface water and/or groundwater flow.

- 6.6.11 The bedrock underlying the proposed Scheme study area comprises an Upper Cretaceous succession of the Chalk group, including the Newhaven and Seaford Chalk Formations. The majority of Chalk lithologies exposed in the study area belong to the Seaford Formation and an area in the vicinity of Stonehenge Down is underlain by the Newhaven Chalk Formation (which is known to contain distinct phosphatic chalks of limited lateral extent). A fault line exists on the eastern boundary of the Newhaven Chalk Formation and trends in a north-south direction, located to the east of the Stonehenge Monument, crossing the current A303.
- 6.6.12 Historical ground investigations in and around the study area of the proposed Scheme have shown Alluvium to be present in the Till valley in Winterbourne Stoke to depths of between 3m and 5m below ground level (bgl) and in the Avon valley to depths of up to 7.5m bgl. The Alluvium associated with the River Till was recorded to comprise flint gravel with Chalk clasts, and lenses and layers of sand, silt and clay. Alluvium associated with the River Avon consists of three distinct units of cohesive Alluvium, Peat and granular Alluvium. Local Head deposits, where encountered, were recorded at depths no greater than 1m to 2m bgl in the base of dry valleys. River Terrace Deposits were encountered in one exploratory hole location in the vicinity of the River Till to a depth of 8.6m bgl.
- 6.6.13 Highly weathered Chalk bedrock has been found to outcrop at the surface in so-called 'interfluve' zones (areas between watercourses) where superficial deposits are absent. Phosphate nodules were proved in the Chalk at depths between 4.3m and 22.45m bgl in three exploratory holes located to the south east of the proposed western tunnel portal.
- 6.6.14 Information contained within the Groundsure Geo Insight Report (Ref 80) indicates that the following natural ground subsidence hazards may exist across the proposed Scheme study area:
- a) there is a negligible to very low potential for shrinkage/ swelling of clays;
 - b) there is a negligible to moderate potential for landslides;
 - c) there is a very low to low potential for ground dissolution of soluble rocks;
 - d) there is a negligible to high potential for compressible deposits;
 - e) there is a negligible to very low potential for collapsible deposits; and
 - f) there is a negligible to low potential for running sands.
- 6.6.15 Information viewed on the MAGIC website indicates that there are no geological SSSIs within the proposed Scheme study area. Furthermore, there are no Local Geological Sites (LGS) within the proposed Scheme study area. These features are therefore scoped out of the assessment.

Mining and Mineral Resources

- 6.6.16 The Wiltshire and Swindon Aggregate Minerals Site Allocations Local Plan (2013) (Ref 121) identifies no Mineral Consultation Areas (MCA), Mineral Safeguarding Areas (MSA) or Preferred Areas (PA) within the study area of the proposed Scheme. There are no active mines, quarries or designated mineral resources in

the proposed Scheme study area. These features are therefore scoped out of the assessment.

Soils and Agricultural Land Classification

- 6.6.17 Soils and Agricultural Land Classification across the Scheme study area are addressed in Section 6.8 (People and Communities).

Land Contamination

Sources

- 6.6.18 Data obtained from the Environment Agency and the local authority that is contained in the Groundsure Report (Ref 80), along with historical Ordnance Survey mapping (Ref 81) and site walkover records, have been reviewed to identify current and historical potential contaminative land uses. A summary of the key areas of potentially contaminated land in the study area is presented in Table 6.24.

Table 6.24: Summary of Potential Sources of Contamination within the Study Area

Potential Sources Within the Study Area	Number of Features Within the Proposed Scheme
Eleven Farms/Farm Buildings	Three within the proposed Scheme.
Military Land Use: a. Former RAF Oatlands Hill (1941–1946) b. Rolleston Camp c. Weapons Store (Tank Artillery) (associated with Larkhill) d. Larkhill (Former Aerodrome and Current Royal School of Artillery) e. Former RAF Stonehenge (1917 – 1921) f. Former RAF Lake Down (1917 – 1924)	Three within the proposed Scheme: a. RAF Oatlands Hill b. RAF Stonehenge, c. RAF Lake Down
Fuel Filling Stations a. Winterbourne Stoke Filling Station b. Amesbury Filling Station c. Countess Filling Station	None within the proposed Scheme

Potential Sources Within the Study Area	Number of Features Within the Proposed Scheme
Industrial Uses (current and former) including: <ul style="list-style-type: none"> a. Dairy b. Historic Engine House c. Former Larkhill Military Light Railway, d. Grain Production/Store facility, e. Former RAF Stonehenge Sewage Works and sewage outfall f. Scrap Yard g. Former Gas Works h. Household Waste Facilities) i. Historic Engine Sheds (1926) j. Two Vehicle Repair Garages k. Former SR Bulford Extension Railway (1924 – 1937) l. Industrial Repairs and Servicing m. Precision Engineers (Engineering Services) n. Depot and Warehousing o. Historic Barn and Above Ground Tank (1877–1939) p. Former Stonehenge Pedigree Stock Farm (1924– 1926, on the site of the former RAF Stonehenge) 	Four within the proposed Scheme <ul style="list-style-type: none"> a. Former Larkhill Military Light Railway b. Former sewage outfall associated with former RAF Stonehenge Sewage works c. Historic barn and above ground tank (1877–1939), d. Former Stonehenge Pedigree Stock Farm (1924– 1926, on the site of the former RAF Stonehenge)
Eight Electricity Substations	None within the proposed Scheme.
Four Pumping Houses	All within the proposed Scheme.
17 areas of potential infilled ground including former pits, former reservoirs, infilled cuttings, ponds quarries and tips.	Four within the proposed Scheme

- 6.6.19 The Groundsure data (Ref 80) shows the following features to be absent from the proposed Scheme study area:
- a) authorised landfills;
 - b) recorded historical landfills;
 - c) industrial facilities with Integrated Pollution Prevention and Control;
 - d) Control of Major Accident Hazards facilities; and
 - e) hazardous substance consents.
- 6.6.20 According to the Groundsure Report (Ref 80), a pollution incident was recorded in the proposed Scheme study area in the vicinity of West Amesbury in 2002, relating to oils and fuel impacting land and water (Category 3, minor incident).
- 6.6.21 The route of a high pressure Esso oil pipeline, aligned south-east to north-west, is intersected by the proposed Scheme alignment in the vicinity of Berwick St.

James and Winterbourne Stoke. Although this is considered as a potential source of contamination, there are no recorded pollution incidents on or around the route of this pipeline within the study area. It is also assumed that appropriate mitigation requirements will be needed as part of the design phase to avoid any interaction with the pipeline that may give rise to contamination. Therefore, it will not be assessed as a potential source in the EIA.

Identified Receptors

- 6.6.22 Human receptors are considered to comprise residents, workers in and visitors to commercial properties, and members of the public accessing areas of open space and community facilities. Construction workers represent additional human receptors during the construction phase only.
- 6.6.23 Controlled waters receptors comprise groundwater and surface water. Groundwater within the Chalk, which underlies the study area for the Scheme, is classified by the Environment Agency as a Principal aquifer of high and intermediate vulnerability. There are four groundwater Source Protection Zones (SPZs) for public drinking water supply abstractions within 0.62 miles (1 kilometre) of the Scheme. These are described below and presented on Figure 6.7.
- a) One located north of Amesbury at Durrington (SPZ1, SPZ2 with the SPZ1 located within the Scheme);
 - b) One located north of Amesbury at Bulford (SPZ1 and SPZ2, located approximately 100m north of the Scheme);
 - c) One located at Shrewton, north of Winterbourne Stoke (SPZ1, SPZ2, SPZ3 500m to 0.62 miles (1 kilometre) of the Scheme; and
 - d) SPZ3 located within the eastern extent of the Scheme east of Amesbury.
- 6.6.24 Groundwater within the Head Deposits located in the study area is classified as a Secondary (undifferentiated) aquifer. The Environment Agency classifies groundwater within Alluvium, River Terrace Deposits and rare peat associated with the channels of the River Avon and River Till as Secondary A aquifers.
- 6.6.25 Recent Environment Agency information obtained indicates that there are six groundwater abstraction licences within 0.62 miles (1 kilometre) of the Scheme. Four of these abstractions are for general farming or commercial use and two relate to potable water supply abstractions. A summary of the groundwater abstraction licence details is provided in Table 6.25 below.

Table 6.25: Groundwater Abstractions within 0.62 Miles (1 Kilometre)

Abstraction Borehole Name	Type of Use	Licence Number	Location
Oatlands Hill, Winterbourne Stoke Well Point B	General farming and domestic	13/43/023/G/065	Within the Scheme area, in the vicinity of Oatlands Hill, west of the A360
Borehole 'A' at Airman's Corner	Energy – heating pump	SW/043/0021/003	85m east of the Scheme (adjacent to Stonehenge Visitor Centre)

Abstraction Borehole Name	Type of Use	Licence Number	Location
Borehole 'B' at Airman's Corner	Private Water Supply: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services	SW/043/0021/003	5m north east of the Scheme (adjacent to Stonehenge Visitor Centre)
WISMA Farm Borehole Point A	General agriculture	13/43/023/G/246	440m south of western area of the Scheme, off Berwick Road south of Winterbourne Stoke
Durrington A	Potable Water Supply	13/43/021/G/152	100m east of the Scheme at Countess Road, south west of Durrington
Druids Lodge Borehole 1	General Agriculture	13/43/021/G/251	Adjacent to southern area of the Scheme, adjacent to the A360, south of Longbarrow Roundabout

- 6.6.26 Two rivers are located in the study area as shown in Figure 6.7; the River Avon at the eastern extent of the proposed Scheme study area and the River Till flowing southwards through Winterbourne Stoke at the western extent of the proposed Scheme study area. Furthermore, there are a number of surface water features that have been identified to be fed mainly or entirely by groundwater and are therefore vulnerable to changes in groundwater level and quality. A detailed review of the Water Environment is provided in Section 6.9.
- 6.6.27 Ecological receptors have been identified in the study area of the proposed Scheme and comprise the River Till in the west which is a designated SSSI, and the River Avon in the east which is a designated SSSI and a SAC. Ecology is considered further in Section 6.4.
- 6.6.28 Property receptors in the Scheme study area comprise residential and commercial properties, agricultural crops, livestock and infrastructure such as below ground utilities.

Value of the Environmental Resources and Receptors

Geology

- 6.6.29 The Chalk underlying the Scheme study area is a Principal aquifer. The Chalk plateau forming Salisbury Plain gives rise to a variety of grasslands which provide an important ecological habitat.

Land Contamination

- 6.6.30 Residents are considered to be the most sensitive human receptors to land contamination. Workers in commercial properties and people accessing areas of public open space are of lower sensitivity due to their different typical exposure scenarios.
- 6.6.31 Groundwater within the Chalk aquifer represents the environmental receptor of highest value and sensitivity in relation to land contamination. The aquifer is of

regional importance in the supply of drinking water and is classified by the Environment Agency as being of high and intermediate vulnerability. Surface water, groundwater and potable water abstraction points have been identified within 1km of the Scheme study area. These are all considered as potential receptors in the event of the mobilisation of contaminants during the construction and operational phases of the Scheme.

- 6.6.32 The rivers identified in the study areas are potential receptors to land contamination and are designated ecological SSSIs (River Avon System SSSI and River Till SSSI) and they are therefore of high environmental value and sensitivity. Ecological SSSIs are discussed further in Section 6.4.

Potential Impacts and Mitigation

Geology

- 6.6.33 Phosphatic Chalk is known to be present in the study area and there are significant uncertainties regarding the material's engineering properties and behaviour. Its presence may therefore present constraints to scheme design and construction.
- 6.6.34 There is currently uncertainty regarding the leachate potential of phosphorus in the phosphatic Chalk at Stonehenge Bottom and the potential risks posed to controlled waters should the material be excavated and re-used within the study area. Additional ground investigation will be undertaken to further investigate the leachate characteristics of the phosphatic Chalk.
- 6.6.35 There is also potential for increased radon potential from the phosphatic chalk. The potential effect is considered to be temporary during the tunnel construction and the risks to construction workers will be mitigated through ventilation and air monitoring. Ventilation as part of the operation of the tunnel will also mitigate risks to tunnel users. Since radon is a noble gas it does not absorb to air particulates and in an outside environment it is dispersed to such an extent it represents no significant risk.

Land Contamination

Construction Effects

- 6.6.36 In the locations of the identified potentially contaminative land uses, there is the potential for construction to affect human and controlled waters receptors and for the ground conditions to impact on the design of the Scheme.
- 6.6.37 Potential impacts include but are not limited to:
- a) mobilising existing contamination in soil and groundwater as a result of ground disturbance and de-watering during construction;
 - b) increasing the potential for contaminants in unsaturated soils to leach to groundwater in open excavations during construction;
 - c) increasing the potential for contaminated surface run-off to migrate to surface water and groundwater receptors as a result of leaching from uncovered stockpiles;

- d) discharge of water from de-watering to surface watercourses;
- e) introducing new sources of contamination, such as fuels and oils used in construction plant and fluids and chemicals used in tunnel boring;
- f) creating preferential pathways for the migration of contamination and gases, for example along new below ground service routes, service ducts and as a result of de-watering; and
- g) introducing new human health receptors such as site staff during construction.

Operational Effects

6.6.38 By the operation stage of the Scheme conditions may have altered from the baseline as a result of, but not limited to:

- a) introducing road users, operational maintenance staff and the road infrastructure as new receptors; and
- b) contamination which has been encountered having been removed or remediated.

Proposed Level and Scope of Assessment

Geology

- 6.6.39 Geology directly influences potential land contamination migration pathways and is scoped into the assessment on this basis. It also influences the geomorphological setting of the area.
- 6.6.40 An assessment of structural/engineering geology will be carried out separately to inform the design and development of the Scheme. It is therefore scoped out of this assessment.

Land Contamination

- 6.6.41 Potentially contaminative land uses have been identified within the study area. The NPSNN (Ref 3) requires that 'for developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination and how best to address this'. A Detailed Assessment, as defined in DMRB HA204/08 (Ref 82), HA200/08 (Ref 89) and Annex A of Interim Advice Note 125/15 (Ref 83), will be carried out to assess the risks posed by land contamination.

Assessment Methodology

Geology

- 6.6.42 Geology will be assessed using published information, existing information from historical investigation and assessment reports (including the 2017 Structural Soils investigation) (Ref 84), the Preliminary Sources Study Report undertaken as part of the previous phase of works and available data from any additional ground investigations that may be undertaken during the impact assessment period.

Land Contamination

Risk Assessment

- 6.6.43 Areas of potential contamination have been identified within the study area of the Scheme. In line with Environment Agency Contaminated Land Report CLR11 (Ref 85), assessment of land contamination will take the form of a tiered, risk-based approach, as summarised below:
- Tier 1: qualitative risk assessment based on a desk top study of available information to identify potential sources of contamination, receptors to contamination and potential pathways between them. The identified sources, pathways and receptors are presented in the form of a preliminary Conceptual Site Model (pCSM) showing the potential contaminant linkages (PCL);
 - Tier 2: If PCL are identified, this means there is a theoretical risk to receptors from contamination and intrusive investigation should be used to provide data to inform a generic quantitative risk assessment (GQRA). The GQRA involves comparison of site-specific, laboratory analytical data against appropriate generic assessment criteria (GAC) for human health and/or controlled waters which represent minimal or tolerable risk; and
 - Tier 3: detailed quantitative risk assessment to identify whether contamination identified above minimal or tolerable risk levels represents an unacceptable risk and therefore requires remediation.

Impact Assessment

- 6.6.44 The approach to assessing the potential impacts of the Scheme will be undertaken by comparing the risk levels at baseline with the preliminary CSM and the risk levels for the construction and post-construction stages respectively, to determine the change in risk at each stage.
- 6.6.45 Potential risks are determined and assessed based on the likelihood (or probability) and consequence using the principles given in the National House Building Council (NHBC) and Environment Agency report R&D66 (Ref 86). This provides guidance on development and application of the consequence and probability matrix to risk assessment and broad definitions of consequence. The risk matrix is presented in Table 6.26.

Table 6.26: Estimation of Level of Risk

Probability	Consequence			
	Severe	Medium	Mild	Minor
High likelihood	Very high risk	High risk	Moderate risk	Low risk
Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

- 6.6.46 The significance of the effects of land contamination is assessed by comparing the difference in risk of each contaminant linkage at baseline to those at construction and a post construction stage. Where there is shown to be a decrease in contamination risk the proposed Scheme is assessed as having a beneficial effect on the environment in the long term.
- 6.6.47 The definitions of the significance criteria used are presented in Table 6.27 below. This provides details of how increases and decreases in the contamination risks identified are related to the significance criteria adopted.

Table 6.27: Significance Criteria

Significance Criteria	Definition
Major adverse effect	An increase in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. from land that has a very low contamination risk in the baseline becomes a high or very high risk
Moderate adverse effect	An increase in contamination risk of 2 or 3 risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk
Minor adverse effect	An increase in contamination risk of 1 risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate/low risk
Neutral effect	No change in contaminated land risks
Minor beneficial effect	A reduction in contamination risk of 1 risk level in the risk matrix, e.g. land that has a moderate/low contamination risk in the baseline becomes a low risk
Moderate beneficial effect	A reduction in contamination risk of 2 or 3 risk levels in the risk matrix, e.g. land that has a high contamination risk in the baseline becomes a moderate/low or low risk
Major beneficial effect	A reduction in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk

Assumptions, Limitations and Uncertainties

- 6.6.48 The current scoping exercise has been based on the collation and evaluation of readily available documentation provided to date by the Environment Agency, BGS, Envirocheck Report and other data sources made available, including the Preliminary Sources Study Report undertaken as part of the previous phase of works. Further information will be obtained as the scheme develops and will be assessed in the EIA.
- 6.6.49 Any borehole data from BGS sources are included on the basis that: 'The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation'.

- 6.6.50 De-watering risk assessments will be undertaken to assess the potential mobilisation of contaminants within and to controlled waters and will be required to cover a wider study area than has been used for the purposes of this topic assessment.
- 6.6.51 This Scoping report is based on the legislation, statutory requirements and/or industry good practice applicable at the time of the works being undertaken. Any subsequent changes in this legislation, guidance or design may necessitate the approach to be reassessed in the light of these circumstances.

6.7 Materials

Introduction

- 6.7.1 This Section describes the scope of the material resources and waste arisings assessment for the proposed Scheme.
- 6.7.2 For the purposes of this scoping report, materials are defined as comprising:
- The use of material resources; and
 - The generation and management of waste.
- 6.7.3 Material resources are defined by IAN 153/11 (Ref 87) as “the materials and construction products required for the construction, improvement and maintenance of the trunk road network. Material resources include primary raw materials such as aggregates and minerals, and manufactured construction products”.
- 6.7.4 Waste is defined as per the Waste Framework Directive (2008/98/EC) (Ref 88) as “any substance or object which the holder discards or intends or is required to discard.”
- 6.7.5 The proposed Scheme will aim to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy (see Figure 6.6).

Figure 6.6: Waste Hierarchy



- 6.7.6 This Scoping Report has been written in accordance with IAN 153/11 which is intended for the "identification of impacts associated with materials resource use and waste arisings" for construction, improvement and maintenance projects and is relevant guidance for this proposed Scheme. In addition to this, DMRB

HA204/08 (Ref 82), HA200/08 (Ref 89), and Annex A of IAN 125/15 have also been followed.

Study Area

- 6.7.7 The study area will comprise the project site and the wider region within which waste management facilities are located and from where construction materials may be sourced.

Planning Policy Context

- 6.7.8 The following national planning policy documents and regulations are relevant to the assessment of materials and waste.
- a) Waste (England and Wales) Regulations 2011 (as amended) (Ref 90);
 - b) The Environmental Permitting (England and Wales) Regulations 2016 (Ref 91);
 - c) Hazardous Waste (England and Wales) Regulations 2005 (as amended) (Ref 92);
 - d) Environmental Protection Act 1990 (as amended) (Ref 93);
 - e) Waste Management Plan for England (Ref 94);
 - f) National Planning Policy for Waste (Ref 95); and
 - g) National Policy Statement for National Networks (December 2014) (Ref 3).
- 6.7.9 In terms of local waste planning policy, Wiltshire Council is the waste disposal authority for the area within which the proposed Scheme lies. Wiltshire Council's "Core Strategy" (adopted 2015) does not include any specific policies on waste management, but instead refers to the "Wiltshire and Swindon Waste Core Strategy 2006-2026", which was jointly prepared by Wiltshire Council and Swindon Borough Council.
- 6.7.10 Subsequent to publication of the Waste Core Strategy, the councils published the Development Plan Document "Wiltshire and Swindon Submission Draft Waste Site Allocations" (February 2012) (Ref 96), which allocated sites for waste management. This Development Plan Document was supported by the report "Evidence base part B: Waste" (Ref 97) which discussed current and future arisings of waste and the treatment capacity within the county.

Baseline Conditions

- 6.7.11 The baseline waste conditions in terms of the locations of facilities and the existing quantities of waste generated will be established. Baseline information will consist of the current capacity of the waste infrastructure and waste arisings in the waste disposal authority (Wiltshire), and in the wider South East and South West planning regions.
- 6.7.12 Detailed information on baseline waste conditions will be collected from sources including local planning documents published by Wiltshire Council, and data on waste facility capacity published by the Environment Agency.

- 6.7.13 The Environment Agency's Waste Management Information 2016 (Ref 98) (published in 2017) includes the following information about waste sent to landfills in 2016 and remaining landfill capacity in Wiltshire, and in the wider south east and south west regions.

Table 6.28: Wiltshire landfill inputs and capacity 2016

Landfill Type	Inputs (000 tonnes)	Capacity (000 tonnes)
Hazardous Merchant	29	424
Hazardous Restricted	-	-
Non Hazardous with SNRHW* cell	64	929
Non Hazardous	301	4,545
Non Hazardous Restricted	-	-
Inert	264	134
Total	658	6,033

Table 6.29: South West landfill inputs and capacity 2016

Landfill Type	Inputs (000 tonnes)	Capacity (000 tonnes)
Hazardous Merchant	148	1,748
Hazardous Restricted	-	-
Non Hazardous with SNRHW* cell	481	4,362
Non Hazardous	1,750	11,025
Non Hazardous Restricted	-	-
Inert	660	9,763
Total	3,038	26,898

Table 6.30: South East landfill inputs and capacity 2016

Landfill Type	Inputs (000 tonnes)	Capacity (000 tonnes)
Hazardous Merchant	14	550
Hazardous Restricted	21	10
Non Hazardous with SNRHW* cell	2,692	29,386
Non Hazardous	2,517	17,237
Non Hazardous Restricted	-	-
Inert	2,792	29,795
Total	8,036	76,979

*SNRHW = selected non-reactive hazardous waste

- 6.7.14 Baseline information on material resources will focus on nationwide demand data on the key raw materials: aggregates, concrete, asphalt and steel.

Potential Impacts and Mitigation

6.7.15 The potential impacts with regards to material resources and waste arisings include the following:

- a) Temporary reduction in material resources available within the relevant markets; and
- b) Effects on-site generated materials (e.g. soils) and waste arisings have on the existing capacity of waste management facilities.

6.7.16 Table 6.31 below summarises the types of materials used and wastes that may potentially be generated.

Table 6.31: Types of Material Use and Waste Generation

Project Activity	Material use	Potential waste arisings
Site remediation / preparation / earthworks / tunnelling	Fill material for construction purposes. Primary and secondary/recycled aggregates for ground stabilisation.	Surplus excavated materials. Stripped topsoil and subsoil. Contaminated soils. Tunnel spoil.
Demolition	Materials are not required for demolition works.	Waste arisings from the demolition of any existing buildings or structures.
Site construction	Construction materials including: Concrete; Asphalt and bituminous material; Cement bound granular material; Well graded granular material; Precast concrete kerb; Timber; Plywood; Cementitious grout; Reinforcing steel; Reinforcing fabric; Geotextile; Geo-composite drainage system; Pipe bedding aggregate; Filter drain material; Tunnel lining;	Packaging from materials delivered to site. Excess and broken/damaged construction materials. Existing highway infrastructure and technology as removed by excavation works. Waste oils from construction vehicles. Waste additives and conditioning agents from tunnel spoil management Construction worker wastes.
Operation and maintenance	Routine maintenance of infrastructure and technology including surfacing asphalt and servicing of electronic equipment.	Waste arising during operation and maintenance expected to be minimal.

6.7.17 The following mitigation measures will be considered and implemented during the design phase and subsequent construction work:

- a) waste arisings will be prevented and designed out where possible;
- b) opportunities to re-use material resources will be sought where practicable;

- c) opportunities to support the circular economy will be considered during the design phase; and
- d) where re-use and prevention are not possible, waste arisings will be managed in line with the waste hierarchy).

6.7.18 Since material use and waste generation is expected to be very small during operation of the proposed Scheme, these aspects have been scoped out of the assessment.

Assessment Methodology

6.7.19 A Detailed Assessment, as defined in IAN 153/11, will be undertaken to assess the impacts of the material resources and waste arisings from the proposed Scheme. As part of this detailed assessment, the following tasks will be carried out:

- a) relevant waste legislation, policies and guidance will be reviewed to identify material use and waste management objectives and targets;
- b) the likely types of material resources and waste arisings will be identified and quantities estimated for the proposed Scheme;
- c) impacts will be evaluated against the national materials markets and the capacity of the regional waste infrastructure;
- d) opportunities to reduce, re-use, recover and/ or recycle material resources and waste arisings will be identified through a review of the proposed development (including proposed building materials, construction methods and design, where available) and in accordance with industry best practices; and
- e) Coordinated and documented consideration and identification of circular economy opportunities during the proposed Scheme's early design stage.

6.7.20 The main outputs from the detailed assessment will be:

- a) the identification of the environmental impacts associated with material resources and waste arisings; and
- b) the measures which will be implemented to mitigate the impacts.

6.7.21 There are potential sources of contamination within the study area that may impact the characterisation and management of the material resources and waste arisings. The extent of any soil contamination and any associated impacts are discussed in Section 6.6 (Geology and Soils). The intrusive ground investigation and existing information will provide an indication on the physical and chemical properties of the excavated arisings within the route alignment which will help identify the suitability for re-use of the excavated arisings and the facilities that could manage any arisings removed from site.

6.7.22 The tunnel will produce a significant volume of excavated arisings (tunnel spoil). The opportunities to re-use or recover this material will depend on the volume produced, the type of tunnelling method used (which may impact the physical

and chemical properties of the tunnel spoil) and the environmental constraints in the area.

- 6.7.23 The assessment will identify and assess a range of management routes for the tunnel spoil, which may include both on-site and off-site options. This will include identifying facilities or locations which may be suitable for reuse, recovery or disposal of the tunnel spoil.
- 6.7.24 These options will be assessed against a range of criteria in order to identify their feasibility and environmental performance, with preference given to options which avoid the need for disposal.
- 6.7.25 A short-list of potentially feasible options for tunnel spoil management will be developed, and where applicable, preferred options may be identified. The technical and regulatory aspects of these options will be described.
- 6.7.26 The Environmental Statement will set out the assessment methodology recognising the requirements of the National Policy Statement for National Networks (2014) (Ref 3), including how significance of effects are to be determined.

Assumptions, Limitations and Uncertainties

- 6.7.27 In undertaking this scoping exercise, the following assumptions have been made:
 - a) Information on the types and quantities of materials used and waste generated will be produced during the design development process; and
 - b) The assessment will identify potentially suitable management routes for major waste streams (including tunnel spoil) and may, where necessary, identify preferred options, but it will not be prescriptive in terms of defining precisely which facilities must be used.
- 6.7.28 Waste management and materials impacts during operation of the proposed Scheme have been scoped out because material use and waste generation is expected to be very small during operation.

6.8 People and communities

Introduction

- 6.8.1 This section outlines the proposed approach to assessing the potential impacts and effects associated with people and communities arising from the Scheme.
- 6.8.2 This will include considering impacts on the following:
 - a) Agricultural land;
 - b) Non-Motorised Users (NMU: pedestrians, cyclists and equestrians);
 - c) Motorised Travellers (MT: drivers and passengers of both public and private vehicles);
 - d) Community severance;

- e) Private assets (including residential properties, local businesses, community facilities and land); and
- f) Development land.

- 6.8.3 The Scheme will be assessed in accordance with DMRB Volume 11 (Ref 99) and IAN 125/15 Environmental Assessment Update. Due to the current transitional stage of the DMRB, it combines the NMU component of DMRB 11.3.8 - Pedestrians, Cyclists, Equestrians and Community Effects, and DMRB 11.3.9 - Vehicle Travellers, DMRB 11.3.6 for Land Use (DMRB 11.3.6) and the Community Effects component of DMRB 11.3.8 (Pedestrians, Cyclists, Equestrians and Community Effects) in accordance with IAN 125/15.
- 6.8.4 Consideration has been given to the potential for impacts on civil and military aviation and defence interests within the context of effects on people and communities in accordance with the NPSNN. No effects are considered to be likely and as such consideration of these impacts has been scoped out.

Study Area

- 6.8.5 The study area varies depending on the effect or type of resource being assessed. The footprint of the Scheme and effects on adjacent land through severance has been used for consideration of effects on agricultural land, development land, and open space. When considering farm viability the study area is widened to consider the implications of land take and severance on whole farms bisected by the route options.
- 6.8.6 Effects on motorised and non-motorised users (NMUs) of existing routes will consider all such resources likely to be affected by alterations in traffic distribution and flows as well as users of the Scheme. The types of resources considered include roads, Public Rights of Way (PRoW) and footpaths located within 0.7miles (1km) of the Scheme.
- 6.8.7 The study area for 'private assets' (including agriculture, residential properties, local businesses, community land and facilities) will consist of the land parcels required to accommodate the Scheme during both construction and operation.
- 6.8.8 The Study Area for 'community severance' will be extended to include communities that may potentially be directly and indirectly affected by the Scheme, for example, through severance caused by a new road or the redistribution of vehicles on the affected road network. These would include communities directly connected by the NMU and MT routes.

Planning Policy Context

National Planning Policy

- 6.8.9 The following policies will be considered as part of the EIA:
- a) The National Planning Policy Framework (NPPF) (2014) (Ref 8);
 - b) The National Policy Statement for National Networks (NPSNN) (Ref 3);
 - c) The Countryside and Rights of Way Act (2000) (Ref 137);

- d) The Highways England Delivery Plan (Ref 138);
- e) The Planning Practice Guidance (2014) (Ref 139);
- f) Safeguarding our Soils: A Strategy for England (2009) (Ref 140); and
- g) The Natural England's Technical Information Note 049 (TIN049) (2009).Local Planning Policy (Ref 141)

6.8.10 The following local policies are relevant to a consideration of effects on people and communities. They describe the relevant planning and development goals put forward by the local authorities to be used to guide local development in the area.

- a) The Wiltshire Core Strategy (2015) (Ref 4);
- b) The Stonehenge, Avebury and Associated Sites World Heritage Site Management Plan (Ref 50).

Baseline Conditions

6.8.11 This Section establishes the current provision and condition of facilities and routes serving local communities for the defined study area (see above). Information gathered and presented has been identified through a desktop study.

Overview

6.8.12 The Scheme is located in the County of Wiltshire which has an estimated population of 488,400 (Ref 100) (2016). The study area surrounding the Scheme mostly comprises arable agricultural land and is sparsely populated. Small settlements are scattered around the area, the main settlement being Amesbury, located north east of the Scheme. Amesbury is the main location for services and community facilities in the study area and has a population of 10,700 inhabitants (2011). Winterbourne Stoke, located 8km west of Amesbury, and Larkhill, located 3 km north-west of Amesbury also offer a number of services. The study area is serviced by a comprehensive network of B and C roads as well as PRoW.

6.8.13 The Scheme crosses the Stonehenge, Avebury and Associated Sites World Heritage Site. The Scheme also crosses the National Character Area 132 Salisbury Plain and West Wiltshire Downs. Salisbury Plain is a predominantly agricultural area with a strong sense of remoteness and openness. It forms a gently rolling chalk downland landscape. The predominant land uses within the study area are agriculture and recreation. The Cranborne Chase & West Wiltshire Downs Area of Outstanding Natural Beauty (AONB) lies approximately 2km west of the Stonehenge WHS.

6.8.14 The proportion of the working population of Wiltshire is 60.1%. This rate is also lower than the South West (60.9%) and national (63.3%) averages. The proportion of the population of Wiltshire whose health is either bad or very bad (4.1%) is 1.5 percentage points lower than across England and Wales (5.6%). Only 4.2% of Wiltshire LSOAs are in the top 20% most deprived parts of the country. This rate is 6.6 percentage points less than the rate across the South West region (10.8%). Overall, Wiltshire residents have better health than recorded on average.

Agricultural Land

- 6.8.15 The study area is principally agricultural, dominated by arable farming. This is mostly wheat or barley, with some oil seed crops, mainly rape, and maize for livestock feed, and cover crop for game. There is permanent pasture on steep slopes and around archaeological sites. Sheep are the main livestock kept but there are also some beef cattle and outdoor pig enterprises.
- 6.8.16 Small areas of woodland are scattered throughout the landscape, some of which contain stands of coniferous trees indicating commercial management (although this may be historic). Management of game for commercial shoots, principally pheasants, is an important activity and the survival of small woodlands on the otherwise open downland is linked to this.
- 6.8.17 Farms are generally large but smaller holdings are found around Winterbourne Stoke where a more diversified land use includes campsites and paddocks for horses, ponies, goats and alpacas. However, a study of aerial imagery indicates that none of these smaller holdings is affected by either option.
- 6.8.18 This area of agricultural land is mapped at a large-scale under the Agricultural Land Classification (ALC) system as mainly Class 3 (good to moderate).

Non-Motorised Users

- 6.8.19 There is a comprehensive network of PRow in the study area. These routes connect Shrewton and Rolleston to Berwick St James and Winterbourne Stoke as well as Larkhill to Stonehenge. These routes serve a wide range of users, including equestrians, hikers and cyclists, locals and tourists alike.
- 6.8.20 On the Amesbury to Berwick Down section of the A303, several PRow can be accessed on either side of the road. PRow ending at the A303 road (WSTO3, WSTO6B, AMES10 and AMES11) or crossing it (AMES12) present safety risks as NMUs use the verges of the A303 or cross it.
- 6.8.21 The only National Cycle Route (NCR) lying in close proximity to the Scheme is the Wiltshire Cycle Way (Route 45). It passes through Amesbury and does not intersect with the Scheme.

Motorised Travellers

- 6.8.22 The A303 High Street/Amesbury Bypass is used as the primary through route for journeys to the South West Region, requiring road users to pass through the Stonehenge WHS, offering views within approximately 200m of the Stones. The volume and speed of traffic as well as journey time reliability causes stress to motorised users. Local services can be found in Amesbury and in Winterbourne Stoke. The Countess Services located at the eastern end of the Scheme, also offers services to motorised travellers though it is a heavily congested section of the A303 which causes driver stress. Congestion is considerable between Amesbury and Berwick Down and also affects the villages of Larkhill and Shrewton.
- 6.8.23 The A360 would cross the proposed Scheme halfway and currently crosses the A303 causing congestion at Long Barrow roundabout. Other routes either intersect or lie adjacent to the proposed Scheme alignment, one of B-

classification (B3083), and several are unclassified, understood to be used for local journeys. There are a number of byways open to all traffic (BOAT) in the Winterbourne Stoke area and south of Stonehenge. One BOAT passes to the west of Stonehenge and crosses the A303 connecting Larkhill to Druids Lodge settlement on the A360 route. Several byways can be accessed on either side of the A303 and connect with the communities of Berwick St James, Great Durnford, Larkhill and Shrewton. Vehicle movement numbers are not currently known.

Community severance

- 6.8.24 Community severance is the separation of residents from the facilities and services they use within their community. Residents of Winterbourne Stoke are served by a full range of services and facilities in Amesbury. The A303 is the primary route between facilities in Amesbury and inhabitants of Winterbourne Stoke. Services at Amesbury include three primary schools, a secondary school, two surgeries, a library and a range of other town centre uses.
- 6.8.25 The village of Shrewton, situated approximately 2.6km to the north of Winterbourne Stoke experiences rat-running associated with congestion along the A303. This results in severance within the village and increased journey times for residents of Winterbourne Stoke accessing the school and limited services on offer in Shrewton.
- 6.8.26 Within Winterbourne Stoke the facilities are limited to St Peters Church, the petrol station shop and a pub (The Bell Inn). These services suffer from severance caused by the A303 passing through the village.

Private Assets

Residential Properties

- 6.8.27 The study area is mostly rural and sparsely populated. The main settlement close to the proposed Scheme is Amesbury. Residential properties within the study area are mainly found in Winterbourne Stoke. This village is currently crossed by the A303 road and lies directly south of the scheme. It comprises 205 people (2011 census). East of Stonehenge, residential properties located in West Amesbury and south of Larkhill also lie reasonably close to the scheme. Dispersed dwellings and farms are scattered through the study Area, mainly in the Winterbourne Stoke area.

Business Premises

- 6.8.28 There are no business premises lying directly on the alignment of the scheme. Stonehenge Cottages, understood to accommodate offices currently, are found on the north side of the A303 to the west of the Countess Roundabout. In Winterbourne Stoke, business premises comprise a bed & breakfast, a motorcycle manufacturer, an events venue and a campsite as well as a filling station and shop off the A303 road. Another filling station and a hotel can be found at the Countess services area. The shop and the café located in Stonehenge Visitor Centre are situated along the A360 road, north of the scheme.

Community Facilities

- 6.8.29 A pub (The Solstice Rest) and a church (St Peters Church) can be found in Winterbourne Stoke but most community facilities used by its inhabitants are located in Amesbury. Connected by the A303 road, they can access a comprehensive range of community assets. Facilities available include three primary schools (Amesbury Archer Primary School, Amesbury Church of England Voluntary Controlled Primary School, Christ The King Catholic Primary School), a secondary school (The Stonehenge School), a library, a leisure centre (Amesbury Sports & Community Centre), a community centre (Bowman Centre), a church (St Mary and St Melor), a cemetery and a range of other services such as a post office and a police station.
- 6.8.30 Winterbourne Stoke residents can also access community facilities in Shrewton, located 2.6km north. Facilities at this location include a cricket club, a primary school (Shrewton CE VC Primary School), three churches (Shrewton Methodist Church, St Mary's Church, St Andrew's Church), a village hall (Maddington Church Room) and a social club (Shrewton Sports & Social Club).
- 6.8.31 Regarding healthcare, in terms of primary care facilities two pharmacies and two surgeries (Barcroft Medical Centre, St Melor House Surgery) are accessible in Amesbury. Two additional surgeries can be found in Shrewton (Shrewton Surgery and The Till Orchard Surgery). The nearest general hospital is Salisbury District Hospital, located 16 km away from Stonehenge.
- 6.8.32 Regarding open space, the proposed Scheme crosses the WHS. National Trust and English Heritage owned land in the immediate vicinity of the Stonehenge site is publicly accessible. The Scheme borders the Parsonage Down National Nature Reserve (NNR) and crosses two rivers, the River Till and the River Avon. In Amesbury, several open spaces lie within 500m of the preferred route: the Holders field and the Amesbury Sports & Community Centre pitches.

Potential Impacts and Mitigation

Agricultural land

- 6.8.33 Construction of the Scheme would require the temporary use of agricultural land for construction activities and thus potential effects may be experienced by farming operations. Dust may affect arable crops and noise may disturb livestock (see Sections 6.1 on Air Quality and on 6.5 Noise and Vibration).
- 6.8.34 During the operational phase, it is possible that agricultural operations might be permanently disrupted owing to potential land take, severance of land parcels and disturbance to farm infrastructure such as water supply and hedgerows.
- 6.8.35 In order to assess the effects of the proposed Scheme on agricultural resources, an Agricultural Impact Assessment will be undertaken. Significance criteria will be adopted which relate to the effects on agricultural land and soils, and on farming and other farm-based enterprises. The significance level attributed to each effect will be assessed based on the magnitude of change due to the proposed Scheme, the sensitivity of the affected receptor/receiving environment to change, and the relative scarcity or abundance of the resource/receptor in the locality, as well as in a wider context, given that some receptors or features may group or converge in a particular locality.

- 6.8.36 The ALC survey will provide a statement of the amount and quality of agricultural land within the land to be acquired or used for the construction and operation of the proposed Scheme. The magnitude of change will be reflected in the land required permanently and temporarily for the proposed Scheme and the sensitivity of the agricultural land resource will be reflected in its grading relative to the abundance of best and most versatile land within a 4km corridor in each community area.

Non-motorised Users

- 6.8.37 With regard to NMUs, potential effects include:
- a) permanent land take on footprint of the at-grade sections, portals and junctions as well as land for mitigation;
 - b) temporary land take, closure or diversion during construction;
 - c) beneficial effects on severance and connectivity of PRowS from the tunnelling of the A303 and downgrading the current road to a byway;
 - d) beneficial and adverse effects on severance of PRow relating to the redistribution of traffic on local roads during and after construction; and
 - e) beneficial and adverse effects on active travel and physical activity through removal or provision of opportunities for walking and cycling.

Impact on the amenity of users of PRow

- 6.8.38 With regard to NMUs, opportunities for mitigation are likely to be focused on benefits for NMUs as well as addressing adverse effects.
- 6.8.39 The opportunity for integration of the downgraded A303 with the wider PRow network would be capitalised upon to ensure a positive legacy.
- 6.8.40 Disruption to PRow during construction would be avoided as far as possible. Suitable diversions would be agreed with Wiltshire County Council and implemented where temporary closures are required. Where the permanent closure of a footpath is deemed unavoidable, an appropriate alternative would be identified, the design of which would have consideration to the health and well-being of users particularly given PRowS are likely to provide recreational opportunity and benefit.

Motorised Travellers

- 6.8.41 With regard to driver views and driver stress, potential effects include:
- a) permanent loss of driver views of the Stonehenge WHS and associated landscape along the tunnelled sections;
 - b) widened views in the River Till valley;
 - c) temporary increase in driver stress across the local network during the construction period;

- d) temporary increase in driver stress if the tunnel has to be temporarily closed;
- e) permanent decrease in driver stress related to improvements in journey time reliability and a reduction in congestion on the A303;
- f) permanent improvement in access to local employment and training opportunities through reduced journey time reliability leading to improved health and wellbeing; and
- g) increases and decreases in levels of driver stress across the wider road network from redistribution of traffic.

Community severance

6.8.42 The potential effects in terms of community severance include:

- a) permanent severance of facilities for residents of villages, caused by a new at-grade alignment;
- b) temporary or permanent severance of community facilities potentially leading to deterioration of social cohesion and affecting mental health;
- c) temporary or permanent severance of healthcare services and other social infrastructure;
- d) permanent reduction of community severance in Winterbourne Stoke;
- e) changes in severance as a result of revised access to the A303 via new grade separated junctions;
- f) Improved access to and within Stonehenge WHS to enhance learning and interpretation;
- g) permanent disruption and delays for residents accessing community facilities resulting from the redistribution of traffic on the wider network; and
- h) temporary disruption and delays on local roads and PRow affecting access to facilities during the construction period and during tunnel closure events.

Private Assets

6.8.43 Identified potential effects on private residences, local businesses and community facilities include:

- a) permanent loss of residential, commercial or community facilities (including open space) on footprint of the at-grade sections and portals;
- b) additional permanent loss of residential, commercial or community facilities (including open space) for essential mitigation such as habitat creation and landscaping;
- c) temporary land take during construction;

- d) potential for noise and vibration and air quality effects arising from construction activities to impact on the health of residents and local workers;
- e) severance or disruption to access to residences and community facilities during and after construction; and
- f) potential severance or loss of open space leading to impact on residents' physical activity and health.

Impacts on the amenity and enjoyment experience of users

- 6.8.44 Short term and long term effects on residential amenity due to changes in traffic levels during and after construction are possible.
- 6.8.45 The People and Communities assessment will address only the direct effects on commercial land in terms of land take..
- 6.8.46 Measures to mitigate effects related to land take from private dwellings and businesses include compensation at market value through negotiation with land owners or the compulsory purchase order process. Land subject to temporary land take would be restored to original land use following construction.
- 6.8.47 Avoidance of disruption or displacement of community facilities should be a priority. However, in the event that loss of land used by the community occurs, provision should be made for a suitable alternative. Discussions with the local authority and local community would identify the value of the land and the need for replacement if lost.
- 6.8.48 Undertaking of construction works in accordance with a Construction Environmental Management Plan (CEMP) and implementing best practice mitigation measures would minimise effects on residences and businesses. Due consideration would be given to the potential for the works to adversely impact on residents and workers health and well-being and how this can be prevented/minimised.

Development land

- 6.8.49 Potential effects on development land are identified as including:
 - a) permanent land take of development land affecting viability for future development of the land allocation; and
 - b) severance or disruption to access during and after construction.
- 6.8.50 Mitigation of effects on development land would include:
 - a) discussions with the promoters of proposed developments to ensure compatibility of proposals;
 - b) discussions with promoters to identify potential cumulative effects during the construction and operational phases;

- c) continued monitoring of planning applications for new development proposals in or around the selected route alignments; and
- d) monitoring of the plan preparation process for the Wiltshire Housing Sites Development Plan Document.

Assessment Methodology

- 6.8.51 The effects related to people and communities will be determined in-part with reference to DMRB guidance on the assessment of impacts on road users. For other aspects of the assessment there is no specific guidance for the determination of impacts and as such potential impacts arising from the Scheme will be assessed using professional judgement. Where relevant, the ES chapter will be compliant with policy set out above.

Agricultural land

Sensitivity of Environmental Resources and Receptors

- 6.8.52 For farms, fields and farm infrastructure, the following scale will be used to determine the sensitivity to effects:
- a) High: farm types in which the operation of the enterprise is dependent on the spatial relationship of land to key infrastructure, and where there is a requirement for frequent and regular access between the two, or dependent on the existence on the infrastructure itself, e.g. dairying; irrigated arable cropping and field scale horticulture; intensive livestock or horticultural production;
 - b) Medium: farm types in which there is a degree of flexibility in the normal course of operations, e.g. combinable arable crops; grazing livestock farms (other than dairying);
 - c) Low: farm types and land uses undertaken on a non-commercial basis.

Assessment of magnitude of impact

- 6.8.53 The main considerations impacting the magnitude assessment are:
- a) Type of impact - direct or indirect;
 - b) Nature of impact - beneficial or adverse or neutral;
 - c) Duration of impact - short or long term, reversible or not;
 - d) Frequency of impact - continuous or intermittent, changing with time or constant; and
 - e) Geographical context - international, national, regional or local.
- 6.8.54 The magnitude of impact on agricultural land will be assessed using the following scale:
- a) High: The identified impacts are predicted to result in major damage to a farm business

- b) Medium: The identified impacts are predicted to result in significant damage to a farm business
- c) Low: The identified impacts are predicted to result in a small amount of damage to a farm business
- d) Negligible: The identified impacts are predicted to result in little or no damage to a farm business

Assessment of Significance of Effects

6.8.55 There is no specific guidance to assess the significance of effects on farm and rural businesses. An effect significance will be assigned using the bespoke scale below:

- a) Large adverse: Renders a full-time farm business, including any diversification enterprises, unworkable in its current form, such that it could not continue unchanged; the business would have to change the activities undertaken on the remainder of the holding as well as seeking some form of alternative income.
- b) Moderate adverse: Changes the workability of a full-time farm business, including any diversification enterprises, but without preventing the business continuing largely as before; there would be reductions in income and changes in day-to-day management, such as longer journeys to access severed land parcels.
- c) Slight adverse: Affects the workability of a full-time farm business, including any diversification enterprises, but with little change to the business continuing largely as before; there would be limited change in income and day-to-day management.
- d) Neutral: Very slight or negligible impact on farm business that can often be easily compensated for by modifications to management system.

Non-motorised Users

- 6.8.56 The assessments for NMU focus on changes in journey lengths and times, the effect on the amenity value of journeys and changes in community severance.
- 6.8.57 The assessment will cover the users of existing routes likely to be affected by alterations in traffic distribution and flows as well as users of the Scheme. A 2km buffer either side of the route alignment will be used to capture the assumed catchment area for community facilities when assessing community severance.

Journey Length and Local Travel Patterns

- 6.8.58 'Journey length' in this assessment is used to cover both the distance travelled and the time taken. The assessment of NMU effects will consider effects arising from the construction and operation of the Scheme. Changes in journey lengths and travel patterns will be predicted using the methodology outlined in the DMRB Vol 11, Section 3, Part 8, Chapters 2 and 3.
- 6.8.59 A qualitative assessment will be undertaken using a three point scale: neutral, beneficial or adverse, to assess the changes in journey length and local travel

patterns experienced by pedestrians, cyclists and equestrians as a result of the Scheme:

- a) Neutral - no significant increase or decrease in journey length and/or travel patterns and no increase or decrease in opportunities for NMUs to access the wider network;
- b) Beneficial - significant decrease in journey length and/or travel patterns and increased opportunities for NMUs to access the wider network; and
- c) Adverse - significant increase in journey length and/or travel patterns and decreased opportunities for NMUs to access the wider network.

Amenity

6.8.60 Amenity is concerned with changes in the degree and duration of NMUs' exposure to traffic, changes in the quality and condition of footpaths, changes in quality of the landscape and for cyclists, signage and crossing provision. Amenity impacts take into account the combined effects from other assessment topics (noise, air quality, traffic, landscape and visual) which could have a cumulative effect on the enjoyment of a public right of way, community facility or residential property.

6.8.61 In assessing amenity, a descriptive approach will be used which will give an overall indication of the change i.e. positive, negative or no change, in the amenity of the receptor. The magnitude of impact on NMUs will be assessed using the following scale:

- a) High: Either three or more residual significant other topic effect (noise, landscape, air quality or traffic) for the public right of way, community facility or residential property with at least one being major in nature, or two major residual significant other effects.
- b) Medium: Two significant residual other environmental effects with at least one being of a major nature.
- c) Low: Two significant residual other environmental effects, both being moderate in nature.
- d) Negligible: One or fewer significant residual other environmental effects.

Community severance

6.8.62 This assessment will consider the extent to which the Scheme would introduce new severance between communities or would provide relief from existing severance for pedestrians and others. New severance results from the introduction of physical barriers - such as new highway infrastructure or increased traffic flows (DMRB Volume 11, Section 3, Part 8, chapter 6). Relief from existing severance results from a reduction in traffic on the existing highway and local road network (DMRB Volume 11, Section 3, Part 8, chapter 7).

6.8.63 New severance will be assessed using a three point scale: slight, moderate or severe severance. These descriptions have been coupled with an estimate of the number of people affected, their location and the community facilities from which

they are severed. The following factors will be taken into consideration in describing community severance between communities:

- a) The physical changes caused by the Scheme;
- b) The consequent changes in traffic levels on existing roads;
- c) The number of people whose journey would be affected;
- d) The presence of particularly vulnerable groups such as children, the aged and
- e) disabled;
- f) The fact that crossing at-grade could take longer during peak hours;
- g) The type of road involved; and
- h) The provision of mitigation.

- 6.8.64 The assessment will consider pedestrians specifically, as it is recognised in DMRB that cyclists and equestrians are less susceptible to changes in severance because they can travel more quickly than people on foot.
- 6.8.65 The following criteria will be used for assessing change in new community severance that has been used to evaluate the effects of the Scheme on severance between communities:
- a) High: People are likely to be deterred from making trips to an extent sufficient to induce reorganisation of their habits. Considerable hindrance would be caused to people trying to make their existing journeys for a prolonged period of time.
 - b) Medium: Some people are likely to be dissuaded from making trips. Other trips would be made longer or less attractive.
 - c) Low: In general the current journey pattern is likely to be maintained, but there would probably be some hindrance to movement for limited amount of time.
- 6.8.66 Relief from existing severance will be assessed using the following three point scale: slight, moderate or substantial. The extent of relief will be assessed by considering the reduction in traffic on the existing highway and local road network in the opening year in the context of the size of community affected, the presence of vulnerable groups, the provision of new crossings or footbridges and the existing road standards.
- 6.8.67 Estimates of the number of people who may benefit from the relief of severance will be made, with special reference to those in vulnerable groups and an indication given of the geographical location of the relief. Table 6.32 Relief from Severance by Reductions in Existing Traffic Levels categorises relief from severance by reductions in traffic levels as outlined in DMRB.

Table 6.32: Relief from Severance by Reductions in Existing Traffic Levels

	Level of Relief from Severance		
	Slight	Moderate	Substantial
Built up Area	30%	30%	30-60%
Rural Area	60-75% ¹	75-90% ²	90%+ ³

Motorised Users

- 6.8.68 The scope of assessment has been prepared with reference to advice contained in Interim Advice Note (IAN) 125/09; this provides advice on assessing the effects on all travellers as introduced in HA 200/08, noting that an assessment of the effects on all travellers uses a mixture of existing guidance on vehicle travellers together with existing guidance on pedestrians, cyclists and equestrians. The assessment for motorised travellers will be limited to consider only those pertinent to motorised travellers, namely; views from the road and driver stress.

Driver Views

- 6.8.69 The assessment of effects on views from the road will be based on the guidance in DMRB Volume 11, Section 3 Part 9 and TAG guidance prepared by Department for Transport (DfT). Within DMRB guidance the quality of views is placed into four categories:
- a) No view - road in tunnel, steep cutting or contained by earth bunds, environmental barriers or adjacent structures;
 - b) Restricted views - frequent cuttings or structures blocking the view;
 - c) Intermittent views - road generally at ground level with shallow cuttings or barriers at intervals; and
 - d) Open views - view extending over many miles or only restricted by existing landscape features.
- 6.8.70 The effects of the Scheme on traveller's views will be assessed for those rerouting from existing routes onto the Scheme using the overall scores suggested in TAG guidance, namely:
- a) Neutral: little or no effect for most views from the road, or improvements on some views are generally balanced by deterioration in others;
 - b) Beneficial: views from the road would be, on balance, a change for the better; and
 - c) Adverse: views from the road would be, on balance, a change for the worse.
- 6.8.71 The significance of effects on travellers views will be assessed using the seven point scale suggested in WebTAG:

- a) Minor beneficial or adverse: where the number of travellers affected is low (less than 500 a day);
- b) Moderate beneficial or adverse: where the number of travellers affected is between 500 to 10,000 travellers per day; and
- c) Major beneficial or adverse: where the number of travellers affected is high (more than 10,000 per day).

Driver Stress

6.8.72 Driver stress related to adverse mental and physiological effects experienced by drivers using the road network. The components of driver stress are:

- a) Frustration;
- b) Fear of accidents; and
- c) Uncertainty relating to the route being followed.

6.8.73 With new or improved routes, designed to accord with DfT standards appropriate categories for driver stress would likely be 'moderate' or 'low' along the extent of the route. Table 6.33 Assessment of Driver Stress on Single Carriageway Roads and Table 6.34 Assessment of Driver Stress on Dual Carriageway Roads set out DMRBs recommendations for assessing driver stress on single and dual carriageway roads respectively.

Table 6.33: Assessment of Driver Stress on Single Carriageway Roads

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed		
	Under 50	50-70	Over 70
Under 600	High	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	Moderate	High

Table 6.34: Assessment of Driver Stress on Dual Carriageway Road

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed		
	Under 50	50-70	Over 70
Under 1200	High	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

6.8.74 The criteria in Table 6.33 and Table 6.34 will be applied subject to the availability of traffic flow and speed data.

6.8.75 As DMRB provides no significance criteria, the significance will be addressed using comparison of present and future conditions, using beneficial, neutral and adverse definitions.

Private Assets – including residential properties, local businesses and community facilities

- 6.8.76 The approach for the assessment of impacts on private assets will focus on the direct effects in terms of land take and demolition. Indirect effects on residential properties, businesses and community facilities are assessed in the NMU and Severance section, specifically under the headings Community Severance, New Severance and Relief from Existing Severance.
- 6.8.77 The assessment of direct effects on private assets will follow guidance set out in DMRB Volume 11, Section 3, Part 6. As it relates to private residences, local businesses and community facilities, the methodology provided in Part 6 includes:
- a) The effects of demolition of property; and
 - b) The loss of land (as opposed to buildings) used by the community (for example public open space).

Development Land

- 6.8.78 A qualitative assessment will be undertaken for the effects on development land allocations and significant planning applications / permissions including:
- a) Permanent land take of development land affecting viability for future development of the land allocation; and
 - b) Severance or disruption to access during and after construction.
- 6.8.79 The significance of effects will be determined through consideration of the relationship between the sensitivity of the receptor and the magnitude of change.

Assumptions, Limitations and Uncertainties

- 6.8.80 The following assumptions have been made in undertaking this scoping exercise:
- a) crossing facilities would be provided where each PRoW is crossed by the new road;
 - b) the assessment methodology will exclude, for the purposes of reporting amenity and isolation effects, residential properties where the total number of dwellings affected is fewer than five. Impacts on individual properties do not constitute a significant community effect. There are a number of individual properties scattered along the route where impacts may be experienced from other topics, such as sound, noise and vibration. These impacts will be reflected in other topic assessments where relevant; and
 - c) community resources are mentioned expressly in the environmental baseline only where they contribute to the local context or where they may be affected by the Scheme. Consequently, not all community resources within the study area are mentioned.

6.9 Road Drainage and the Water Environment

Introduction

- 6.9.1 This Section considers the assessment of the effects of the proposed Scheme on the water environment during both the construction and operational phases and the constraints posed by the existing groundwater and surface water conditions on the proposed Scheme.

Study Area

- 6.9.2 The spatial scope of the assessment will include as a minimum, features of the water environment within one kilometre of the preferred route alignment. The study area will be extended to five kilometres for the groundwater assessment, to encompass potential areas to be used for construction and the potential zone of influence on Water Framework Directive (WFD, 2000/60/EC) groundwater bodies and groundwater Source Protection Areas (SPZ) caused by dewatering required for construction, principally tunnelling and operational purposes.

Planning Policy Context

- 6.9.3 The following planning policies have been taken into account as part of identifying the assessment methodology, receptor selection/sensitivity, potential significant environmental effects, and mitigation:
- a) **National Policy Statement for National Networks** – paragraphs 4.36 to 4.47 in relation to climate change adaptation; paragraphs 4.48 to 4.56 in relation to pollution control; paragraphs 5.90 to 5.115 in relation to flood risk; and, paragraphs 5.219 to 5.231 in relation to water quality and resources.
 - b) **National Planning Policy Framework (NPPF)** – paragraphs 100, 102 and 103 in relation to flood risk and paragraphs 109 and 120 regarding water quality.
 - c) **Wiltshire Council Core Strategy Development Plan Document** – core policy 67 (flood risk), core policy 68 (water resources) and core policy 69 (River Avon Special Area of Conservation (SAC)).
- 6.9.4 These policies identify the need for a site specific flood risk assessment to inform the assessment of flood risk from all types of flooding to and from the development. They require the assessment to consider the vulnerability of users of the proposed infrastructure, consider the impacts of climate change and confirm whether flood risk is increased elsewhere. In addition, local flood risk management strategies and surface water management plans should be considered when assessing local flood risk. The policies also identify measures to mitigate flood risk through sustainable surface water management.
- 6.9.5 With regard to water quality and water resources, the policies require consideration of the impacts of pollution from development on the water environment by assessing water bodies, protected areas under the Water Framework Directive (WFD, 2000/60/EC) safeguard zones, water protection zones, Source Protection Zones around potable groundwater abstractions and ecological sites. Specifically, Wiltshire Council Core Strategy core policy 69

identifies the River Avon SAC as a potential sensitive receptor which requires protection from adverse pollution impacts resulting from development. The policies also encourage mitigation of pollution on the water environment through careful design to facilitate good pollution control practice.

6.9.6 The NPPF Planning Practice Guidance sections on “flood risk & coastal change” (2014) and “water supply, wastewater & water quality” (2015) which support the application of NPPF policies have also been taken into account and provide further detail regarding the methodology for assessing flood risk and impacts on the water environment

6.9.7 Other relevant policies related to the water environment are:

- a) Wiltshire Council Local Flood Risk Management Strategy (LFRMS) (2015)
- b) Wiltshire Council Groundwater Management Strategy (GMS) (2016)

6.9.8 The LFRMS refers to the need for the use of sustainable drainage systems (SuDS) within development proposals so there is no increase in flood risk, which will influence the options for managing surface water. The GMS identifies a number of measures for controlling development in areas that may be prone to groundwater flooding, which will need to be considered in the methodology for assessing the impact and potential mitigation required for the Proposed Scheme, including consideration of the WFD requirements.

Baseline Conditions

6.9.9 To inform the scoping stage, a desk-based assessment of all available resources has been undertaken. These resources have included the previous work undertaken for the appraisal of options, publicly available data (largely web-based sources such as the Environment Agency - What's In Your Backyard and Catchment Data Explorer, MAGIC Maps and published reports), historical investigations carried out between 2001 and 2006 and available ground investigations undertaken to date, which include groundwater level and quality monitoring..

Surface Water

6.9.10 The study area lies within the South West River Basin District, Avon Hampshire management catchment, as set out within the South West River Basin Management Plan (RBMP) (Ref 101).

6.9.11 Two WFD surface water bodies have been identified within the study area and are detailed in Table 6.35 below. The Environment Agency has designated both water bodies within the study area as Protected Areas under the WFD, recognising particular sensitive features within them that require specific protection. These are linked to designations under the Habitats Directive (92/43/EEC). In line with the DMRB, watercourses that are designated as Protected Areas, or support them have been assigned a very high importance.

Table 6.35: WFD Surface Water Body Summary

Water body Name	Water body ID	Current Status	Objective	Protected Area	Importance
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Hampshire Avon (Upper) d/s Nine Mile River confluence	GB1080 430223 52	Moderate	Good by 2021	Yes Habitats Directive	Very High
Till (Hampshire Avon)	GB1080 430225 70	Good	Good by 2015 ⁵	Yes Habitats Directive Nitrates Directive	Very High

6.9.12 The study area also contains other surface watercourses and water features that are not classified under the WFD but which are still part of the WFD water bodies and contribute to their overall quality and status. These features include, but are not limited to:

- a) Tributary channels and ditches located on the River Avon floodplain upstream and downstream of Amesbury;
- b) Tributary channels and ditches located on the River Till floodplain downstream of Winterbourne Stoke;
- c) A number of small ponds located in the River Till floodplain to the north and south of Winterbourne Stoke;
- d) A number of ponds/lakes located in the River Avon floodplain to the north of Amesbury;
- e) A small seasonal pond at Lake, south of Amesbury.

6.9.13 The status of and the potential impact on these water bodies, along with any other identified water features with surface or groundwater hydraulic connectivity, as a result of the construction and operation of the Scheme will be considered as part of the EIA.

6.9.14 The identification of any hydraulically isolated ponds will be completed as part of the EIA but they will only be considered in an ecological context as due to their isolation they would not be affected by changes in flow or quality. Potential ecological changes will be considered in the Biodiversity Section (Section 6.4).

Groundwater

6.9.15 The White Chalk is present within the study area and is designated as a Principal aquifer by the EA. This WFD groundwater body is called the Upper Hampshire Avon, and includes the Seaford and Newhaven Chalk Formations present in the study area, and the Lewes Nodular Chalk Formation that outcrops at Berwick St James to the south of the western section of the Scheme. The details for the WFD water body are shown in Table 6.36. The Chalk typically has a low primary

⁵ The objective of Good status by 2015 was met in that year; as a central aim of WFD is no deterioration the Good status objective remains in place for the next WFD review milestone in 2021

permeability related to the low porosity, but a high secondary permeability imparted by the presence of fractures. Groundwater flow in the Chalk is dominated by fracture flow, which facilitates rapid groundwater movement. These types of Principal aquifer support water supplies and/or river baseflow on a strategic scale. The Chalk aquifer is of regional importance for private and public water supply.

Table 6.36: WFD Groundwater Body Summary

Water body name	Water body ID	Current Chemical Status (2016)	Objective	Current Quantitative Status (2016)	Objective
Upper Hampshire Avon	GB40801G806900	Poor	Good by 2027	Poor	Poor by 2015 ⁶

6.9.16 Small areas of Secondary A, Secondary B and Secondary (undifferentiated) Superficial aquifers, designated by the EA, are present in the study area:

- a) The Secondary A aquifers are associated with the alluvial and terrace gravel deposits which provide groundwater that flows to the Rivers Avon and Till and other surface water bodies. Secondary A aquifers are permeable layers with a moderate to high primary permeability and which are capable of supporting water supplies at a local rather than strategic scale, and in some cases form an important source of baseflow support to rivers.
- b) The Secondary B aquifers are associated with sand and clay deposits located on hill tops. These are predominantly lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
- c) The Secondary (undifferentiated) aquifers are associated with the head deposits present across the study area. These aquifers are defined where it has not been possible to provide an A or B category.

6.9.17 There are four Source Protection Zones (SPZs) for public drinking water supply abstractions within the study area (5 kilometres):

- a) One located north of Amesbury at Durrington;
- b) One located north of Amesbury at Bulford;
- c) One located at Shrewton, north of Winterbourne Stoke; and
- d) One located south of Amesbury, for an abstraction near Little Durnford.

The SPZs for these sources are shown on Figure 6.7. Part of SPZ 1 for the Durrington source is within the DCO boundary. Additional licensed and

⁶ The objective of Poor status by 2015 was met in that year, no current improvement from current status has been identified as a future objective

unlicensed groundwater abstractions are present in the area highlighting the importance of groundwater within the vicinity of the Proposed Scheme.

- 6.9.18 Groundwater levels in the Chalk aquifer respond rapidly to recharge events at the surface due to a low storage capacity. Significant changes in the groundwater level can occur over a short period of time. Annual fluctuations shown in the Environment Agency borehole at Berwick Down are between approximately 6m and 25m. Groundwater is known to rise locally to the surface following periods of high rainfall, including in the normally dry valleys of Stonehenge Bottom and the River Till north of Berwick St James.
- 6.9.19 Groundwater in the Chalk aquifer flows in a generally southerly direction and discharges naturally as baseflow to the Rivers Avon and Till. The Avon is perennial whereas the Till is a winterbourne north of Berwick St James. Localised ephemeral flow occurs within the dry valleys in the Chalk landscape, where preferential pathways are formed by more permeable zones during periods of high groundwater level. This is the case in the Stonehenge Bottom area. There is also a second north-south trending dry valley to the east of Coneybury Hill.
- 6.9.20 There are a number of surface water features that have been identified to be fed mainly or entirely by groundwater and are therefore vulnerable to changes in groundwater level and quality:
- a) The upper reaches of the River Till where it flows as a winterbourne on an intermittent basis, north of Berwick St James;
 - b) A seasonal spring at Springbottom Farm;
 - c) A seasonal groundwater-fed lake near the village of Lake, just to the west of the River Avon;
 - d) A spring system at West Amesbury; and
 - e) Blickmead Spring (adjacent to the archaeological site of Vespasian's Camp), in the grounds of Amesbury Abbey.
- 6.9.21 The locations of the springs are linked to normally dry Chalk valleys, with the spring at Springbottom Farm and the groundwater-fed lake at Lake located at the base of the dry Chalk valleys south below Stonehenge Bottom.

Flood Risk

- 6.9.22 Regarding fluvial flood risk, the River Avon and the River Till have areas of Flood Zone 2 and Flood Zone 3 associated with them which are within areas with limited existing development. Existing floodplains have the potential to be impacted by any crossings over them or by changes to nearby existing roads.
- 6.9.23 Areas of known pluvial (surface water) and groundwater flooding are present in the study area. These include the wider contributing catchments of the River Avon, River Till, the dry valleys such as Stonehenge Bottom, Springbottom Farm to Lake, and parts of Amesbury.

- 6.9.24 There is no reservoir flood risk in the study area as indicated by the Environment Agency flood maps. This will therefore be scoped out from further assessment in the EIA.
- 6.9.25 There are known historical records of flooding caused by rapid snow melt on still-frozen ground, for example in the River Till valley.
- 6.9.26 Existing flood events on roads in the study area are recorded in Highways England's Drainage Data Management System (DDMS) and these will be investigated as part of the assessment.
- 6.9.27 It is recognised that both the River Avon and River Till are internationally designated as part of the River Avon Special Area of Conservation (SAC), and the River Avon System and the River Till are Sites of Special Scientific Interest (SSSIs). The potential for ecological effects on these designated sites from the Scheme will be addressed under the scope of Section 6.4 Biodiversity.

Summary

- 6.9.28 Table 6.37 summarises the water environment receptors and their importance. The sensitivity/importance criteria will be based on those identified in the DRMB guidance and outlined further within the PEI R.

Table 6.37: Environmental Resources, Receptors and Importance

Water Topic	Resource	Importance
Surface water (based on WFD objectives, geomorphology and other EU designations)	Hampshire Avon (Upper) downstream of Nine Mile River confluence	Very High
	Till (Hampshire Avon)	Very High
Ponds and other surface water features	Features with surface and groundwater hydraulic connectivity. Unknown at the time of reporting	High
Groundwater (including quality and quantity)	Principal Chalk aquifer and WFD water body	Very High
Groundwater abstractions and discharges	Abstractions with Published Source Protection Zones	Very High
	Other groundwater abstractions and discharges unknown at the time of reporting	To be confirmed
Flood risk	Hampshire Avon (fluvial)	Medium
	River Till (fluvial)	High
	Hampshire Avon (pluvial)	Medium
	River Till (pluvial)	High
	Pluvial flooding elsewhere in study area	Medium
	Groundwater Flooding	High
Water-dependent designated sites	River Avon SAC and any other water dependent sites identified in Section 6.4 Biodiversity	Very High

Potential Impacts and Mitigation

6.9.29 Potential effects on the water environment during the construction phase include:

- a) risks to the water environment due to:
 - i. excavation, and the subsequent deposition of soils, sediment, or other construction materials causing pollution;
 - ii. spillage of fuels or other contaminating liquids causing pollution;
 - iii. temporary physical modifications interrupting the natural passage of surface and sub-surface flow; and
 - iv. mobilisation of contaminants following disturbance of contaminated ground or groundwater, or through uncontrolled site runoff.
- b) risks to groundwater associated with cuttings and/or tunnel construction including:
 - i. contamination risk to the underlying Chalk aquifer;
 - ii. temporary dewatering, if required, for tunnel construction diverting water away from groundwater-dependent receptors, or bypassing part of the system, leading to reduced groundwater flow; and
 - iii. release or leaching of substances (e.g. cement or grout) used in the tunnelling process which may negatively impact groundwater quality.
- c) effects on existing abstractions or discharges from dewatering activities, if required, which could cause drawdown of the local water table.
- d) potential increase in flood risk:
 - i. construction work taking place within the floodplain;
 - ii. phased construction work may temporarily impact on the function of the floodplain, existing processes and proposed mitigation measures;
 - iii. temporary and/or permanent deposition of excavated material may impact on existing flood flow paths or flood storage areas;
 - iv. during the construction process, operations within the floodplain could result in an increase in flood risk elsewhere.
- e) potential effects on water dependent designated sites (namely the River Avon SAC including the Rivers Avon and Till) from, for example discharge of abstracted water during construction resulting in excess summer flows and/or increased additional silt loading that could impact the ecological features of the system.

6.9.30 Construction mitigation is likely to include:

- a) works undertaken with regard to Government planning practice, water-land management guidance matters and the DMRB to ensure the avoidance, and reduction of impacts on the water environment is taken fully into account in the EIA;
- b) works undertaken in line with a Construction Environmental Management Plan for the Scheme;
- c) close communications with the Environment Agency and Wiltshire Council in relation to groundwater and flood risk;
- d) bunding for areas that may generate contaminated water;
- e) water discharged to self-contained units with treatment facilities;
- f) no direct discharges to groundwater or surface waters without appropriate treatment;
- g) tests would be undertaken to ensure contaminated material is identified, isolated and reworked or removed to appropriate landfill to avoid any water quality impacts;
- h) floodplain working would be minimised as far as possible; and
- i) temporary land-take would include adequate areas of land set aside for robust control measures, for example sustainable drainage control and water treatment.

6.9.31 Potential effects during the operational phase include:

- a) effects on surface water arising from pollutants e.g. oils from fuel combustion/accidental spillages and salts or herbicides from road maintenance;
- b) direct physical and hydromorphological impacts from watercourse crossings and other hydraulically linked surface water features with potential for direct effects on the biological, chemical and physical WFD parameters for both surface waters and groundwater bodies;
- c) permanent dewatering of the aquifer, which has the potential to depress groundwater levels in close proximity to the internationally-designated groundwater-fed Rivers Avon and Till that could affect habitats and/or species;
- d) pumping of surface water and groundwater required for the operation of the tunnel, which could cause changes in flows;
- e) those caused by lengths of the tunnel below the maximum groundwater level in the Chalk creating a barrier to groundwater flow. This could lead to a rise in groundwater levels on the northern, upstream side, which could cause additional groundwater flooding, and a reduction of groundwater levels on the southern, downstream side. There are a number of springs in

the area including the spring system around Amesbury Abbey, which could potentially be affected;

- f) any discharges to ground that may have implications for groundwater quality;
- g) construction of proposed bridge piers on the River Till, other structures, cuttings, embankments and other landscaping features or material deposited, within the floodplain or intersecting key overland flow paths (within both River Till and River Avon catchments) that have the potential to alter flood flows and increase flood risk;
- h) discharges from new sections of highway that have the potential to increase flood risk for receptors downstream; and
- i) any road structures, highways cuttings, embankments or other landscaping features constructed in the floodplain which have the potential to alter flood flows and increase flood risk.

6.9.32 Operational mitigation is likely to include:

- a) pollution treatment measures incorporated into the design where a risk of pollution has been identified;
- b) design of the scheme to minimise the risk of flooding to and from the road structures;
- c) design of the scheme to minimise/avoid the need for long-term groundwater dewatering, where elimination through design is not possible there may be a potential need to relocate existing abstractions and discharges;
- d) design of the scheme to minimise/avoid the need for culverting and diversion of watercourses and drains;
- e) where elimination through design is not possible, culverts would be designed to minimise any effects on the flora and fauna. Existing wildlife corridors would be maintained where possible;
- f) where elimination through design is not possible, diverted watercourses and drains would be designed in such a way to ensure no loss of habitat or flood conveyance, and where practicable to enhance biodiversity, geomorphology and flood storage; and
- g) ensure any discharge of dewatered water is balanced to greenfield runoff rates before discharge to surface water, or recirculated to the groundwater environment.

Assessment Methodology

- 6.9.33 Based on the level of data at the time of reporting and the sensitive receptors identified within the study area, all water topics will be scoped into the EIA as identified in Table 6.37 above. All potential receptors, with the exception of flood risk from artificial sources (reservoirs), will be scoped into the assessment.

- 6.9.34 The nature and location of the Proposed Scheme relative to key characteristics of the water environment and the importance of potential receptors means that a Detailed Assessment will be undertaken.
- 6.9.35 In order to assess the potential impacts of the Scheme on controlled waters, a conceptual hydrogeological model of the area will be prepared. The conceptual model will form the basis of a risk assessment of the potential impacts of the construction and operation of the Scheme on groundwater in the Chalk and on associated surface waters. The risk assessment will be undertaken using the source-pathway-receptor approach promoted by DEFRA and the Environmental Agency. For there to be an identifiable risk, there must be a source i.e. a contaminant/activity and a receptor and a pathway, which allows the source to impact on a receptor. All three elements must be present before a linkage can be realised.
- 6.9.36 The method for assessing the importance, magnitude and significance of effects will be as outlined in the unpublished version of DMRB Volume 11, Section 3, Part 10 HD45 – Road Drainage and the Water Environment.
- 6.9.37 The following will be undertaken as part of the EIA:
- a) data requests to the Environment Agency, Wiltshire Council, and Wessex Water to gather further details on the baseline groundwater and surface water conditions;
 - b) an assessment of potential effects on groundwater flow from the construction and operation of the tunnel and cuttings through use of the Environment Agency Wessex Basin Groundwater Model;
 - c) an assessment of potential effects of routine road runoff on groundwater and surface water quality;
 - d) an assessment of spillage risk on receiving water bodies;
 - e) an assessment of existing and potential flood risk associated with the preferred route alignment. This will be supported by independent fluvial and pluvial hydraulic modelling to current industry standard level of detail, which will assist in ensuring that no detrimental flood risk is posed to (or from) the Proposed Scheme or other sensitive receptors; and
 - f) an assessment of potential effects on water-dependent ecological species will be considered as part of the assessments for both surface water and groundwater.
- 6.9.38 All sources of flood risk to and from the proposed development, including rapid snow melt, will be assessed as part of a Flood Risk Assessment within the EIA. This assessment will include consideration of the current climate change guidance for flood risk (Ref 102).
- 6.9.39 A separate WFD compliance assessment will be undertaken which will consider the potential effects of the Proposed Scheme on the current and target WFD status of the water bodies. For the surface water bodies this will assess biological, hydromorphological and/or physio-chemical quality elements. For the

groundwater body this will assess quantitative and chemical quality elements. Where potential adverse effects are identified, an assessment of these will inform what mitigation measures need to be incorporated into the design and construction methods of the Proposed Scheme to remove or minimise the effect on the aquatic environment.

Assumptions, Limitations and Uncertainties

- 6.9.40 It is assumed that data on all existing licensed and unlicensed, domestic groundwater abstractions will be made available.

6.10 Climate

Introduction

- 6.10.1 This section presents the outcomes of the scoping assessment for the climate related topics. To align with the requirements of the IP EIA Regs 2017 and the National Networks NPS it has been divided into two separate aspects:
- a) Greenhouse gas (GHG) impact assessment – effects on climate change of GHG emissions arising from the proposed Scheme, including how the project will affect the ability of Government to meet its carbon reduction plan targets (in accordance with NN NPS para 5.17);
 - b) Climate change resilience assessment – the resilience of the proposed Scheme to climate change impacts, including how the proposal will take account of the projected impacts of climate change (in accordance with NN NPS para 4.40 and the IP EIA Regs 2017).
- 6.10.2 For purposes of clarity, this section addresses each of the two climate topic assessments separately. In-combination effects of a changing climate and the proposed scheme on the surrounding environment will be considered in the 'Cumulative Effects' section of the ES.
- 6.10.3 As stated in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) Synthesis Report (Ref 105), mitigation (i.e. reducing GHG emissions) and adaptation (i.e. responding to climate change impacts) are complementary approaches to reducing risks of climate change impacts over different timescales. Mitigation, in the short-term and medium-term, can substantially reduce climate change impacts in the latter decades of the 21st century. Benefits from adaptation can be realised now to address current risks, and can be realised in the future to address emerging risks. Innovation and investments in environmentally sound infrastructure and technologies can both reduce lifecycle GHG emissions and enhance resilience to climate change.

Study Area

GHG impact assessment

- 6.10.4 The study area will cover all GHG emissions arising during the construction, operation, maintenance and use of the dual two lane all-purpose carriageway on the A303 trunk road between Amesbury and Berwick Down in Wiltshire, links between existing dual carriageways and the two junctions on the A345, a new 2.9km tunnel, the Winterbourne Stoke bypass.

- 6.10.5 The environmental impact associated with GHG emissions is a national and global issue. Consequently, the potential significance of the proposed Scheme's lifecycle GHG emissions will be assessed by comparing the estimated GHG emissions from the proposed Scheme against the reduction targets defined in the Climate Change Act (2008) (Ref 107) and associated carbon budgets.

Climate Change Resilience assessment

- 6.10.6 The study area for the resilience assessment will be the same as that defined for the lifecycle GHG impact assessment i.e. the entire project construction site and the surrounding natural environment.

Planning Policy Context

- 6.10.7 The following national and local planning policies are of relevance and will be considered during the GHG impact assessment and the climate change resilience assessment.
- a) Climate Change Act 2008 (Ref 106)
 - b) National Networks National Policy Statement (NNNPS) (Ref 3)
 - c) EIA Directive 2014/52/EU(Ref 122)
 - d) Carbon Budget Orders (2009) (Ref 123)
 - e) England Biodiversity Strategy (2011) (Ref 124)
 - f) National Planning Policy Framework (NPPF) and associated National Planning Practice Guidance (NPPG) (Ref 8)
 - g) Nationally Significant Infrastructure Projects (NSIPs) (Ref 116)
 - h) Wiltshire Local Transport Plan, 2011 – 2026 (Ref 120)
 - i) Wiltshire Core Strategy Draft Topic Paper 1: Climate Change (Consultation, June 2011) (Ref 4)
 - j) Wiltshire Council Climate Change Adaptation Action Plan (2016) (Ref 1)

Baseline Conditions

GHG impact assessment

- 6.10.8 The baseline for the GHG impact assessment will be a “business as usual” scenario whereby the proposed Scheme does not go ahead. As such there are associated GHG emissions from use and maintenance of the existing road. In addition, the greenfield land itself will be acting as a GHG emissions sink. Accordingly, the baseline will include an estimation of the size of this GHG emissions sink so that effects associated with expected land use change through the proposed Scheme will be included in the assessment.

Climate Change Resilience Assessment

- 6.10.9 A review of all available and relevant information sources will be undertaken to establish existing and future baseline data and current understanding with regards to climate change and extreme weather risks.

Existing baseline:

- 6.10.10 The Local Climate Impacts Profile for Wiltshire (LCLIP) (2010) (Ref 107) assessed the vulnerability of council services to severe weather events, and was based on a review of media stories in the local press over an eight year period. The Wiltshire LCLIP covers the period between January 2003 and March 2010. The LCLIP review found that Wiltshire is already experiencing major weather events and that several highly significant events occurred over the eight year LCLIP period. The most frequent impacts of these events were infrastructure disruption which had a direct impact on frontline service delivery as well as indirectly impacting all services through access to offices or workplaces.
- 6.10.11 Several events which took place during the study period were recognised as being highly significant, these being:
- a) high temperatures / heat waves in August 2003 and July 2006: leading to strain on water and energy utilities, significant damage to road infrastructure (and also to rail infrastructure in 2003), danger to vulnerable groups (and excess deaths reported nationally in 2003);
 - b) excessive rainfall / flooding in July 2007 and January 2008: leading to flooding of properties in several towns across Wiltshire, infrastructure disruption (particularly road and rail infrastructure in 2008); and
 - c) frost / snow / ice in February 2009 and January 2010.
- 6.10.12 The LCLIP also identifies possible impacts arising due to weather events. Examples relevant to road infrastructure include:
- a) High temperatures / heat waves: ‘melting’ roads, damage to structures
 - b) High winds: health and safety risks, infrastructure disruption and damage, property damage.
 - c) Excessive rainfall / flooding: health and safety risks, infrastructure disruption and damage.
- 6.10.13 The LCLIP also notes that subsidence can result in significant damage to infrastructure and can be the result of high temperatures and corresponding changes in the moisture content of soil or growth of vegetation.
- 6.10.14 Met Office historic climate data from the Boscombe Down Weather Station (the closest Weather Station to the proposed Scheme area) (Ref 108) show that for the period 1981-2010, average annual maximum daily temperatures were 14.1°C, with July being the warmest month on average (mean maximum daily temperature of 21.9°C) and January being the coldest month on average (mean daily minimum temperature of 1.1°C). Mean annual rainfall levels were 748.6mm, with November being the wettest month on average (84.0mm of rainfall on

average for the month) and July being the driest month on average (48.9mm of rainfall on average for the month). January is, on average, the windiest month, with July and August being the least windy.

- 6.10.15 There is strong agreement that the climate is changing beyond that of expected natural fluctuations. Met Office records show that Central England temperatures have increased by 1°C since the 1970s, total summer rainfall has decreased in most parts of the UK, and the UK has experienced 9 of the 10 warmest years on record since 1990 (Ref 108).

Future baseline

- 6.10.16 The UK Climate Projections 2009 (UKCP09) (Ref 109) provide the best scientific picture of how global climate change is likely to affect the south west region of England. UKCP09 projections for Wiltshire suggest that, by the 2080s (2070-2099), the county will experience an increase in summer mean temperature of up to around 4.9°C, and of winter mean temperatures of up to around 3.5°C compared to the 1961-90 baseline records. Winter mean precipitation is expected to increase by up to 29% and summer mean precipitation is expected to decrease by up to 34% by the 2080s. The frequency of severe weather event is also projected to increase due to climate change. UKCP09 projections indicate that, by the 2080s (2070-2099) there could be up to 32 annual heatwaves (compared to a baseline of less than 2 days per year for 1961-1990), up to 11 dry spells lasting more than 10 days (compared to a baseline of 8).
- 6.10.17 As noted by the UK Climate Change Risk Assessment (CCRA 2012) (Ref 110), the South West of England is already impacted by extreme weather events and the report also identifies key risks and implications from a changing climate, which includes:
- a) Changes in extreme weather conditions will impact on infrastructure, in particular through storm damage, flooding and high temperatures; and
 - b) Flooding of transport, including roads and rail is likely to increase, affecting both urban and rural access routes.
- 6.10.18 In specific relation to key infrastructure such as roads, the CCRA report notes that the South West has a great length of roads and railways at significant likelihood of river and tidal flooding. Flooding of transport infrastructure and the associated disruption is projected to increase, affecting both urban and rural access routes.
- 6.10.19 The proposed Scheme area may already be susceptible to surface water run-off and flooding, and the impacts of high temperature, high winds and other weather types. These will be assessed as part of the study. The project, specifically the construction of the proposed Scheme, has the potential to increase surface water run-off during periods of heavy precipitation as there will be a reduced amount of bare land, soil and vegetation ground coverage.

Potential Impacts and Mitigation

GHG impact assessment

- 6.10.20 The proposed scope of the assessment is GHG emissions arising from the construction, operation, maintenance and use of the proposed Scheme. End of life assessment of the demolition phase is considered out of scope for this proposed Scheme due to the length of the operational phase. To identify the key contributing GHG emission sources and/or activities associated with the proposed Scheme a lifecycle approach has been taken in this scoping assessment. This approach is consistent with the principles set out in BS EN 15804 (Ref 111) and PAS 2080 (Ref 112), the IEMA guidance (Ref 113), and Chapter 4 of the TAG Unit A3 Environmental Impact Appraisal (Ref 114). The key anticipated GHG emission sources are set out in Table 6.38 below:

Table 6.38: Key anticipated GHG emissions sources

Lifecycle stage	Activity	Primary emission sources
Pre-construction stage	Enabling works	Vehicles and fuel use for generators on site Workers travelling to and from the site of the proposed Scheme
	Land clearance	Loss of carbon sink
Product stage	Raw material extraction and manufacturing of products required to build the proposed Scheme	Embodied GHG emissions
Construction process stage	On-site construction activity Transport of construction materials (where these are not included in embodied GHG emissions) Transport of construction workers Disposal of any waste generated by the construction processes	GHG emissions from vehicle use GHG emissions from disposal of waste.
Operation stage	Operation of associated road and tunnel lighting, overhead gantries etc Maintenance including re-surfacing	GHG emissions from energy and fuel use Embodied emissions associated with re-surfacing materials
Use stage	Vehicle journeys	GHG emissions per vehicle km Energy consumption

- 6.10.21 Mitigation measures will be identified to reduce GHG emissions across the lifecycle of the proposed Scheme. Mitigating measures to be considered will include:
- A Construction Environmental Management Plan (CEMP) prepared and implemented by the selected construction contractor to include a range of best practice construction measures;
 - Specification of alternative materials with lower embodied GHG emissions;

- c) Low carbon design specifications such as energy-efficient lighting and durable construction materials to reduce maintenance and replacement cycles.

6.10.22 The final selection of the most appropriate mitigation measures will be detailed as part of the lifecycle GHG impact assessment in the ES for the proposed Scheme. This will include GHG emission mitigation measures concerning construction and operation of the proposed Scheme.

Climate Change Resilience assessment

- 6.10.23 The proposed Scheme area may be vulnerable to a range of climate change risks, including an increased frequency and severity of prolonged and/or heavy precipitation events, prolonged droughts and heatwaves, a greater frequency of very hot days, and an increased risk of storms. Warmer temperatures may also mean that the risks associated with ice and snow will decrease over time, but retaining the ability to respond to these events will remain important.
- 6.10.24 The proposed Scheme itself may also be vulnerable to a range of climate change risks. These include, but are not limited to:
- a) Material deterioration due to high temperatures and also from periods of heavy rainfall;
 - b) Flood risk on the network and damage to drainage systems;
 - c) Storm damage to structures and other assets;
 - d) Inaccessible network during extreme weather events; and,
 - e) Reduced pavement and asset deterioration (over time) from less exposure to freezing, snow and ice
- 6.10.25 A number of general mitigation and adaptation measures will be considered to address these risks, many of which will have been identified by other parts of the EIA and the proposed Scheme design. The assessment will assume that the proposed Scheme will be designed to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes. The assessment will also identify and take into account the existing resilience measures for each risk either already in place or in development for infrastructure and assets.

Assessment Methodology

GHG Impact Assessment

- 6.10.26 In line with the World Business Council for Sustainable Development (WBCSD)/World Resources Institute (WRI) Greenhouse Gas Protocol guidelines (Ref 115), the GHG emissions study will be reported as tonnes of carbon dioxide equivalent (tCO₂e) and consider the six Kyoto Protocol gases:
- a) Carbon dioxide (CO₂);
 - b) Methane (CH₄);

- c) Nitrous oxide (N₂O);
- d) Sulphur hexafluoride (SF₆);
- e) Hydrofluorocarbons (HFCs); and
- f) Perfluorocarbons (PFCs).

6.10.27 GHG emissions will be assessed using a calculation-based methodology as per the below equation:

a) Activity data x GHG emissions factor = GHG emissions value

6.10.28 In line with the National Policy Statement for National Networks (2014) (Ref 3), significance of impacts will be assessed by comparing estimated GHG emissions arising from the proposed Scheme with UK carbon budgets, and the associated reduction targets.

6.10.29 In line with the IP EIA Regs 2017 (Ref 2) Schedule 4 Part 5, a description of the likely significant effects of the development on the environment, resulting from the vulnerability of the project to climate change, will be provided.

6.10.30 The emissions assessment outcomes will also be put into context in terms of sector specific carbon impacts by comparing estimated project emissions against other similar infrastructure Schemes.

6.10.31 Whilst the scope of the assessment will cover the lifecycle stages identified above, we propose that the GHG assessment will comprise two parts reflecting both the level of certainty of future activity and GHG emissions and the extent that the predicted GHG emissions will be additional to the existing GHG inventory.

6.10.32 The first part of the GHG assessment will include the construction, operation (e.g. road lighting) and maintenance of the proposed Scheme itself. The majority of these emissions will be additional to the existing National GHG inventory and will be compared to the Carbon Budgets and other similar infrastructure Schemes.

6.10.33 The second part of the GHG assessment will be the 'use' of the proposed Scheme i.e. those resulting from vehicles travelling on the road. As at least part of the GHG emissions associated with the use of the proposed Scheme will be displacement from elsewhere in the UK, they will not be additional to the UK GHG inventory. We recognise that identifying and quantifying the balance of what is additional versus displaced with any level of certainty will be challenging. The GHG assessment for proposed Scheme 'use' will therefore be done on a scenario basis, with quantification of a number of different scenarios to provide a range for the additional GHG emissions associated with the proposed Scheme.

6.10.34 Two types of data will be collected for the GHG assessment: activity data and GHG emissions factors. A set of standard data quality principles will be applied so that the results from the GHG assessment are as accurate and representative as possible.

- a) age – the GHG assessment will be based on activity data and GHG emissions factors applicable to the study period;
- b) geography – activity data will reflect the design of the proposed Scheme. GHG emissions factors will be representative of the UK construction industry and UK transport sector;
- c) technology – the default solution will be to apply data which is representative of the UK construction industry and transport sector. However, technology specific data may be used for the purpose of developing scenarios of the future;
- d) methodology – activity data will be gathered directly from the proposed Scheme's engineering and design teams to enable consistency and completeness of data collection; and
- e) competency – activity data will be generated by the engineering and design teams in-line with applicable industry standards. Data gaps will be replaced with either peer reviewed publications (e.g. paper published in recognised journals) or industry specific literature (e.g. UK construction trade associations). GHG emissions factors will be sourced from a range of sources: EPDs (which adhere to the BS EN 15804 standard), LCA tools (also aligned with best practice), and industry specific and Government sources which are widely accepted and used.

Climate change resilience assessment

- 6.10.35 This assessment will address the resilience assessment of the proposed Scheme to climate change impacts. The assessment will include all infrastructure and assets associated with the proposed Scheme. It will assess resilience against both gradual climate change, and the risks associated with an increased frequency of extreme weather events.
- 6.10.36 The assessment will assume that the proposed Scheme will be designed to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes. The assessment will also identify and take into account the existing resilience and adaptation measures for each risk either already in place or in development for infrastructure and assets.
- 6.10.37 The degree to which the frequency of these potential hazards may change as a result of climate change is explained in the UKCP09 climate change projections.
- 6.10.38 In line with the IP EIA Regs 2017 Schedule 4 Part 5, a description of the likely significant effects of the development on the environment, resulting from the vulnerability of the project to climate change, will be provided.

Assumptions, Limitations and Uncertainties

- 6.10.39 The methodology as detailed above assumes that the following information is available:
 - a) Information on energy use, types and quantities of materials used and waste generated will be available during the design process. Where it is not

available assumptions based on industry approximations and professional best practice will be made.

- 6.10.40 GHG emissions from the end of life stage of the proposed Scheme have been scoped out of the assessment due to the anticipated operational length of the proposed Scheme.
- 6.10.41 All assumptions and limitations, including any exclusions, together with assumptions for choices and criteria leading to exclusion of input and output data will be documented as part of the assessment.

6.11 Cumulative Effects

- 6.11.1 The need to consider cumulative effects in planning and decision making is set out in planning policy including NPPF and the National Policy Statement for National Networks (Ref 3). Paragraph 4.16 of the National Policy Statement for National Networks specifies that:

“When considering significant cumulative effects, any environmental statement should provide information on how the effects of the applicant’s proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence).”

- 6.11.2 In addition paragraph 4.3 states that:

“In considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account:

- *its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits; and*
- *its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.”*

- 6.11.3 The Planning Inspectorate’s Advice Note 17 (Ref 116) on the assessment of cumulative effects identifies a four stage approach:
- a) Stage 1 - establish the project’s zone of influence and identify a long list of ‘other development’;
 - b) Stage 2 - identify a shortlist of ‘other development’ for the cumulative impact assessment;
 - c) Stage 3 - information gathering; and
 - d) Stage 4 – assessment.
- 6.11.4 The DMRB Volume 11, Section 2 Part 5: Assessment and Management of Environmental Effects (HA205/08) requires that possible cumulative effects are

included as part of the assessment process. Cumulative effects are broadly defined as incremental effects that result from the accumulation of a number of individual effects, either caused by the proposed Scheme (intra-project effects) or by other reasonably foreseeable developments which would be under construction at the same time as the proposed Scheme or built later (inter-project effects).

- 6.11.5 Where it is identified that other schemes are expected to be complete before construction of the proposed Scheme, their effects will be considered through the extrapolation of the future baseline.

Assessment Methodology

- 6.11.6 The assessment of cumulative effects will consider the following:
- a) the combined effects from the proposed Scheme on a single receptor of a number of individual environmental impacts, for example noise, dust and traffic;
 - b) the effects of other developments in the vicinity of the proposed Scheme which are under construction or have been consented, which when combined with the effects of the proposed Scheme may have an incremental significant effect; and
 - c) the individual effects on a receptor which when summed (including in a regional context or over the length of the proposed Scheme), result in an effect of greater significance than the sum of the individual effects (i.e. synergistic effects).

Inter-project effects

- 6.11.7 The assessment of cumulative effects arising from the proposed Scheme in combination with other proposed Schemes (inter-project effects) will primarily constitute a desk-top study of planning documents considered relevant to the assessment. The focus of the desk-top study will be the collection of information relating to the background of relevant projects, their expected timelines and likely environmental impacts.

Intra-project effects

- 6.11.8 The main source of data for the intra-project cumulative effects assessment will be the outcomes and information obtained from the individual environmental topic assessments.

Stage 1 - long-list of other development

- 6.11.9 A review of other developments will be undertaken, initially encompassing a 'zone of influence' defined by the environmental topic specialists and the traffic model area.
- 6.11.10 As the proposed Scheme progresses, the list of 'other development' to be included in the assessment of cumulative effects will be reviewed and developed in consultation with the local planning authorities, statutory consultees and other relevant organisations.

6.11.11 Development will be included in the initial long-list based on the following criteria⁷:

- a) development currently under construction;
- b) approved applications which have not yet been implemented (covering the past five years and taking account of those that received planning consent over three years ago and are still valid but have not yet been completed);
- c) submitted applications not yet determined;
- d) refused applications, subject to appeal procedures not yet determined;
- e) on the National Infrastructure Planning Programme of Projects;
- f) development identified in the relevant Development Plan (and emerging Development Plans); and
- g) development identified in other plans and programmes which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

6.11.12 Criteria will be developed and applied to filter development which may be excluded from the initial long list, having regard to the size and spatial influence of each development. These criteria will be documented and set out within the ES.

Stage 2 - short list of other development

6.11.13 At Stage 2, any developments of a nature or scale without the potential to result in cumulative impacts will be excluded, following discussion with the local planning authorities and consideration of each environmental topic's likely zone of influence. The justification for including or excluding developments from the long list will be provided in a matrix, modelled on the example given within Appendix E of PINS Advice Note 17.

Stage 3 – information gathering

6.11.14 Information relating to other developments will be collected from the appropriate source (which may include the local planning authority, the Planning Inspectorate or directly from the applicant / developer) and will include, but not be limited to:

- a) proposed design and location information;
- b) proposed programme of construction, operation and demolition; and
- c) environmental assessments that set out baseline data and effects arising from 'other development'.

Stage 4 – assessment

6.11.15 The assessment will include a list of those developments considered to have the potential to generate a cumulative effect together with the proposed Scheme, and this will be documented in a matrix⁸ which includes the following:

⁷ These criteria are derived from those presented in PINS Guidance Note 17, Table 3.

- a) a brief description of the development;
- b) an assessment of the cumulative effect with the proposed Scheme;
- c) proposed mitigation applicable to the proposed Scheme including any apportionment; and
- d) the likely residual cumulative effect.

6.11.16 The criteria for determining the significance of any cumulative effect will be based upon:

- a) the duration of effect, i.e. will it be temporary or permanent;
- b) the extent of effect, e.g. the geographical area of an effect;
- c) the type of effect, e.g. whether additive or synergistic;
- d) the frequency of the effect;
- e) the 'value' and resilience of the receptor affected; and
- f) the likely success of mitigation.

Human health

6.11.17 The EIA Directive (2014/52/EU) aims to achieve high levels of protection of human health & wellbeing and the environment. It requires that direct and indirect effects of a project on human health & wellbeing should be identified, described and assessed in a method appropriate to each individual case.

6.11.18 It also requires consideration of potential interactions between human health & wellbeing and other aspects included in the directive such as land, air, climate, noise and landscape when identifying and evaluating potential effects.

6.11.19 As detailed in Section 5.8 of this Scoping Report, a number of EIA topics will consider human health within the scope of their assessments however it is considered that these assessments. A qualitative assessment of information collated via the other topic assessments will be undertaken and presented within the Cumulative Effects section of the ES.

6.11.20 The qualitative assessment of the potential effects of the proposed Scheme on human health will consider the following health and well-being determinants as identified from those set out in the HUDU Rapid Health Impact Assessment Tool Second Edition 2015 (Ref 132):

- a) Access to healthcare services and other social infrastructure;
- b) Access to open space and nature;
- c) Air quality, noise and neighbourhood amenity;

⁸ The assessment matrix will reflect the example presented at Appendix 2 of PINS Advice Note 17.

- d) Accessibility and active travel;
- e) Access to healthy food;
- f) Access to work and training; and
- g) Social cohesion and neighbourhoods.

6.11.21 Within these determinants, the following direct and indirect influences on human health & wellbeing that the proposed Scheme could generate will be discussed and conclusions drawn:

- a) Direct effects on health and wellbeing through changes in noise and air pollution, water quality and climate change;
- b) Lifestyle changes such as encouraging travel by means other than private car, for example encouraging walking and cycling behaviours;
- c) Effects on local employment opportunities and activity through changes in access to employment;
- d) Effects on access to key services and social infrastructure such as health facilities and education facilities; and
- e) Effects on accessibility to open space and recreation space.

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Glossary

AADT	Annual Average Daily Traffic is a measure used in transportation engineering and is the number of vehicles that will use a new or improved road on an average day
AQMA	Places where air quality objectives are not likely to be achieved. Where an AQMA is declared, the local authority is obliged to produce an Action Plan in pursuit of the achievement of the air quality objectives.
CEMP	A site specific plan developed to ensure that appropriate environmental management practices are followed during the construction phase of a project.
Cumulative Effects	Effects upon the environment that result from the incremental impact of an action when added to other past, present or reasonably foreseeable actions. Each impact by itself may not be significant but can become a significant effect when combined with other impacts.
EIA	Environmental Impact Assessment. A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement.
Environmental effect	The consequence of an action (impact) upon the environment such as the decline of a breeding bird population as a result of the removal of hedgerows and trees.
Environmental impact	The change in the environment from a development such as the removal of a hedgerow.
Environmental Statement	A document produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations to report the results of an EIA.
Flood Zone Three	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Flood Zone Two	This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Grade Separated Junction	A junction where the conflicting traffic flows are kept apart, usually by means of a bridge or tunnel.
LA10,18h	The noise level exceeded for 10% of the time between 06:00 and 24:00. It is the noise parameter calculated in the methodology provided in Calculation of Road Traffic Noise (CRTN). A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures.
Mitigation	Measures including any process, activity, or design to avoid, reduce, remedy or compensate for negative environmental impacts or effects of a development
NSIP	Nationally Significant Infrastructure Projects ("NSIP") are large scale developments such as certain new harbours, power generating stations (including wind farms), highways developments and electricity transmission lines, which require a type of consent known as 'development consent' under procedures governed by the Planning Act 2008 (and amended by the Localism Act 2011).

PEI	<p>PEI is defined in the EIA Regulations as: 'information referred to in Part 1 of Schedule 4 (information for inclusion in environmental statements) which –</p> <ul style="list-style-type: none"> (a) has been compiled by the applicant; and (b) is reasonably required to assess the environmental effects of the development (and of any associated development).'
Principal Aquifer	<p>These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.</p>
Receptor	<p>A component of the natural or man-made environment that is affected by an impact, including people.</p>
Secondary A aquifer	<p>These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.</p> <p>These are generally aquifers formerly classified as minor aquifers.</p>
Secondary B aquifer	<p>These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.</p>
Setting	<p>The surroundings within which a heritage asset is experienced and any element which contributes to the understanding of its significance.</p>
Source Protection Zone	<p>Source Protection Zones ("SPZ") show the risk of contamination from any activities that might cause pollution to groundwater sources such as wells, boreholes and springs used for public water supplies. The closer the activity, the greater the risk. SPZs can comprise of up to three main zones (inner, outer and total catchment). A fourth zone of special interest can also occasionally be applied to a groundwater source.</p>
Water Framework Directive	<p>The Water Framework Directive ("WFD") introduced a new system for monitoring and classifying the quality of surface and ground waters.</p> <p>The Directive requires that Environmental Objectives be set for all surface waters and groundwater to enable them to achieve Good Ecological Potential/Status by a defined date.</p>

Abbreviations

AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
APIS	Air Pollution Information System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ARN	Affected Road Network
BGS	British Geological Survey
BNL	Basic Noise Level
BOAT	Byway Open to All Traffic
BS	British Standard
CCRA	Climate Change Risk Assessment
CDM	Construction (Design and Management) 2015 Regulations
CEMP	Construction Environmental Management Plan
CIfA	Chartered Institute for Archaeologists
CRTN	Calculation of Road Traffic Noise
CSR	Client Scheme Requirements
CWS	County Wildlife Site
DCO	Development Consent Order
DDMS	Drainage Data Management System
DfT	Department for Transport
DM	Do-Minimum
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
EFT	Emission Factor Toolkit
EIA	Environmental Impact Assessment
END	Environmental Noise Directive
EPS	European Protected Species
EqIA	Equalities Impact Assessment
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
GAC	Generic Assessment Criteria
GHG	Greenhouse Gases
GMS	Groundwater Management Strategy
GPA	Good Practice Advice
GQRA	Generic Qualitative Risk Assessment
HER	Historic Environment Records
HGV	Heavy Goods Vehicle
HLC	Historic Landscape Characterisation
HMAG	A303 Heritage Monitoring and Advisory Group
HRA	Habitats Regulations Assessment
HSWA	Health and Safety at Work Act 1974

IAN	Interim Advice Note
IPCC	Intergovernmental Panel on Climate Change
LAQM.TG	Local Air Quality Management Technical Guidance
LCIP	Local Climate Impacts Profile
LCT	Landscape Character Type
LED	Light Emitting Diode
LFRMS	Local Flood Risk Management Strategy
LGS	Local Geological Sites
LI	Landscape Institute
LNR	Local Nature Reserve
LOAEL	Lowest Observable Adverse Effect Level
LVIA	Landscape and Visual Impact Assessment
MCA	Mineral Consultation Areas
MOD	Ministry of Defence
MSA	Mineral Safeguarding Areas
MT	Motorised Travellers
NCA	National Character Areas
NCR	National Cycle Route
NERC	Natural Environment and Rural Communities
NHBC	National House Building Council
NHLE	National Heritage List for England
NMP	National Mapping Programme
NMU	Non-motorised users
NNNPS	National Policy Statement for National Networks
NNR	National Nature Reserve
NOEL	No Observed Effect Level
NOx	Nitrogen Oxide
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NRMM	Non-Road Mobile Machinery
NSIP	Nationally Significant Infrastructure Report
OS	Ordnance Survey
OUV	Outstanding Universal Value
PA	Preferred Areas
PA 2008	Planning Act 2008
PCF	Project Control Framework
PCL	Potential contaminant linkages
PCM	Pollution Climate Mapping
PEI Report	Preliminary Environmental Information Report
PPG	Planning Policy and Guidance
PPG-N	Planning Practice Guidance on Noise
PPV	Peak Particle Velocity
RBMP	River Basin Management Plan
RPG	Registered Park and Garden
RSPB	Royal Society for the Protection of Birds

RTA	Road Traffic Accident
SAC	Special Area of Conservation
SNHRW	Selected non-reactive hazardous waste
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SPZ	Source Protection Zones
SSSI	Sites of Special Scientific Interest
TBM	Tunnel Boring Machine
TIN	Technical Information Note
TPO	Tree Preservation Order
TRL	Transport Research Laboratory
UNECE	United Nations Economic Commission for Europe
VED	Visual Effects Drawings
VES	Visual Effects Schedule
VMS	Vehicle Management System
WBCSD	World Business Council for Sustainable Development
WFD	Water Framework Directive
WHLC	Wiltshire Historic Landscape
WHO	World Health Organisation
WHS	World Heritage Site
WRI	World Resources Institute
WSBRC	Wiltshire and Swindon Biological Records Centre
WSHER	Wiltshire and Swindon Historic Environment Record
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

Appendix A

Transboundary Screening Matrix

Appendix A: Transboundary Effects Screening Matrix

A2.1. Regulation 32 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the consideration of any likely significant effects on the environment of another European Economic Association (EEA) State.

A2.2. Guidance upon the consideration of transboundary effects is provided in PINS Advice Note 12: Development with significant transboundary impacts consultation.

A2.3. The following screening matrix provides the consideration of transboundary effects for the proposed scheme, taking guidance from Advice Note 12 (Annex).

Table A1: Screening Matrix for Possible Substantial Effects on the Environment of Another EEA State

Criteria and Relevant Considerations	Commentary with Regard to Proposed Scheme
Characteristics of the development <ul style="list-style-type: none"> Size of the development Use of natural resources Production of waste Pollution and nuisance Risk of accidents Use of technologies 	<p>The project comprises the construction of a dual two lane carriageway (i.e four lanes in total), approximately 12.6km in length, to replace the existing single carriageway (two lanes total) A303 between Amesbury and Berwick Down. The scheme comprises offline and online components including a new tunnel and a bypass to the north of Winterborne Stoke.</p> <p>The resources required for the construction of the proposed scheme are likely to be obtained from the global market but it is envisaged that materials would be obtained locally wherever possible. No waste, nuisances or accidents are likely to extend beyond the border of the UK. No novel technologies are proposed that have potential for transboundary effects.</p>
Geographical area <ul style="list-style-type: none"> What is the extent of the area of a likely impact under the jurisdiction of another EEA state? 	<p>No impacts are likely to extend beyond the jurisdiction of the UK, with the exception of potential greenhouse gas emissions.</p>
Location of development <ul style="list-style-type: none"> What is the existing use? What is the distance to another EEA state? (Name EEA state) 	<p>The existing land use is highway for the proposed Scheme, although there are some areas which cross agricultural land to the north and south of the existing A303. The proposed Scheme is located approximately 158km from France and 325km from Southern Ireland.</p>
Cumulative impacts <ul style="list-style-type: none"> Are other major developments close by? 	<p>There are a number of proposed developments within 5km of the proposed scheme which will be taken in account by the traffic model. The potential cumulative effect upon transport emissions from the proposed scheme and proposed development will therefore be accounted for in the proposed scheme EIA. However, it is not anticipated that there is potential for significant cumulative transboundary greenhouse gas emissions effects from these developments.</p>
Carrier <ul style="list-style-type: none"> By what means could impacts be spread (i.e. what pathways)? 	<p>The impact of greenhouse gas emissions would be spread by atmospheric processes.</p>
Environmental importance <ul style="list-style-type: none"> Are particular environmental values (e.g. protected areas – name them) likely to be affected? Capacity of the natural environment Wetlands, coastal zones, mountain and forest areas, nature reserves and parks, Natura 2000 sites, areas where environmental quality standards already exceeded, densely populated areas, landscapes of historical, cultural or archaeological significance 	<p>The Scheme is partially located within the Stonehenge, Avebury and Associated Sites World Heritage Site. The nearest nationally important designated ecological sites are the River Avon SAC and SSSI, and the River Till SSSI and SAC which are located within the proposed draft DCO site boundary. In addition, the proposed Scheme is located within 80m of the Salisbury Plain SAC, and Parsonage Down NNR. Normanton Down RSPB Reserve is located approximately 320 m from the proposed Scheme.</p> <p>There are a number of local designated sites within 2 km of the proposed Scheme. The closest of which is the Countess Cutting County Wildlife Site which is less than 100 m from the indicative provisional DCO boundary.</p>

Criteria and Relevant Considerations	Commentary with Regard to Proposed Scheme
	The potential for significant effects on these designated sites will be accounted for in the EIA which will be undertaken for the Scheme.
Extent <ul style="list-style-type: none"> What is the likely extent of the impact (geographical area and size of the affected population)? 	The only potential transboundary environmental impact which is considered likely is from greenhouse gas emissions, which are known to contribute to changes on climate on a global scale.
Magnitude <ul style="list-style-type: none"> What will the likely magnitude of the change in relevant variables relative to the status quo, taking into account the sensitivity of the variable? 	<p>Total UK greenhouse gas emissions were estimated to be 495.7 million tonnes carbon dioxide equivalent (MtCO₂e) in 2015, whilst greenhouse gas emissions from UK transport were estimated to be approximately 120 MtCO₂e (Department for Business, Energy & Industrial Strategy (7 February 2017¹).</p> <p>The proposed Scheme is likely to make a contribution to UK greenhouse gas emissions. It is proposed to calculate the likely greenhouse gas emissions as part of the proposed EIA scope to assess this.</p>
Probability <ul style="list-style-type: none"> What is the degree of probability of the impact? Is the impact likely to occur as a consequence of normal conditions or exceptional situations, such as accidents? 	The probability of the proposed scheme to contribute to greenhouse gas emissions is likely and would occur as a consequence of the construction and normal operating conditions.
Duration <ul style="list-style-type: none"> Is the impact likely to be temporary, short-term or long-term? Is the impact likely to relate to the construction, operation or decommissioning phase of the activity? 	The impact is likely to be long-term, relating to both construction and operation.
Frequency <ul style="list-style-type: none"> What is likely to be the temporal pattern of the impact? 	The temporal pattern is likely to be relatively constant.
Reversibility <ul style="list-style-type: none"> Is the impact likely to be reversible or irreversible? 	The impact is considered irreversible within human lifetimes.

¹ <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2015>

Appendix B Major Events

Appendix B - Long List of Major Events

		Relevant for long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Covered already in ES? If so, where?	Covered outside of ES - reference document	Mitigation available?
	Natural Disasters						
1	Geological disasters						
1.1	Avalanches and landslides	No	The Geotechnical team will consider this risk as a fundamental part of their design. This will ensure that the risk is designed out, both in terms of the vulnerability of the proposed scheme to these types of event, and also in terms of the potential for the proposed scheme to increase the risk of such an event happening. There is considered to be no receptor that could therefore be of greater risk.	N/A	N/A		
1.2	Earthquakes	No	The site is not in a geologically active area and as such earthquakes are considered to be a real risk or serious possibility.	N/A	N/A		
1.3	Sinkholes	Yes	Although this is likely to be covered in the geotechnical design, there are sufficient examples of roads that have been affected by sinkholes to warrant taking this event forward.	Road users	No		
1.4	Volcanic eruptions	No	Although volcanic eruptions can impact on air travel, for example, it is considered highly unlikely that an ash cloud could significantly impact on any aspect of the A303 project.	N/A	N/A		
2	Hydrological disasters						
2.1	Floods	Yes	Both the vulnerability of the project to flooding, and its potential to exacerbate flooding, are to be covered in the Flood Risk Assessment and will also be reported in EIA terms in the of the ES, both in terms of the risk to the A303 Project and increased risk due to the A303 project.	Road users, property and people in areas of increased flood risk.	Yes - Road Drainage and the Water Environment chapter		
2.2	Limnic eruptions	No	Not applicable as there are no lakes nearby	N/A	N/A		
2.3	Tsunami/Storm surge	No	Not applicable as not in a coastal location.	N/A	N/A		
3	Meteorological disasters						
3.1	Blizzards	No	Blizzard conditions could cause road users to be trapped on the road, however the risk is no different from other roads/road users in the UK, and as such is not considered further.	N/A	N/A		
3.2	Cyclonic storms	No	No - not applicable	N/A	N/A		
3.3	Droughts	No	Droughts are only considered as a disaster due to water shortages for essential services and where there are indirect impacts on food production, loss of soils etc. The proposed scheme is not considered to be vulnerable to drought.	N/A	N/A		
3.4	Thunderstorms	Yes	As the bridge is elevated, some consideration will be given to the potential risk of lightning strikes, though the risk is not considered to be any greater than any other road bridge.	Road users	No	Possibly - to be reviewed with design team.	
3.5	Hailstorms	No	No	N/A	N/A		

3.6	Heat waves	Yes	Some consideration will be given to the potential for the tunnel to be more sensitive to heat wave consitions, though it is likely that a tunnel will be less sensitive than the the open road, which is directly exposed to the sun.	Road users	No	Possibly - to be reviewed with design team.	
3.7	Tornadoes	No	Although there are tornadoes in the UK, their desstructive force tends to be much less than in other parts of the world and the proposed scheme is not particularly vulnerable to any potential effects.	N/A	No		
3.8	Wildfires	Yes	There may be some potential for scrub, grassland or heather fires, though the risk is no greater than the existing road. The reduced accident rate means the risk of an RTA causing a fire is actually reduced.	Road users, habitats and species.	No		
3.9	Air Quality Events	Yes	Although relevant, as vehicles emissions can contribute to poor air quality, it is not considered necessary to undertake any more assessment than is already proposed for the Air Quality assessment.	Road users and local residents	Yes - Air Quality chapter.		
5	Space disasters						
5.1	Impact events and airburst	No	The proposed scheme is considered to be no more vulnerable than any other development.	N/A	N/A		
5.2	Solar flare	Yes	Solar flares can interrupt radio and other electronic communications. The increased reliance on roadside technology could mean the new scheme is more vulnerable than the existing route.	Road users	No	Possibly - to be reviewed with design team.	
6	Transport						
6.1	Road Accidents	Yes	The risk posed by spillage from hazardous loads as a result of a road traffic accident e.g. fuel tankers will be considered in the Road Drainage and Water Environment Chapter. Although military vehicles may use the road, they already use the existing road, and given the reduced accident rate, it is unlikely that there will be any increase in relation to Major Events.	Road users, aquatic environment.	Covered in Road Drainage and the Water Environment Chapter.	Possibly - to be reviewed with design team.	
6.2	Rail Accidents	No	No railways located close to the scheme.	N/A	N/A		
6.3	Aircraft Disasters	Yes	Although there is an RAF base in the vicinity, it is to the east of Amesbury, and there is not considered to be an increased risk to road users. Any increase in bird strike - what have MoD safeguarding team said?	Road users, pilots and aircraft.	Likely to be covered in the design - confirmation to be sought of agreement from MoD safeguarding team.		
6.3	Maritime Disasters	No	Distance from sea	N/A	N/A		
7	Engineering Accidents/Failures						
7.1	Bridge Failure	Yes	A bridge crossing forms part of the design.	Road users	No	Yes - to review with design team	Yes - by design - signposting to securing mechanism in DCO
7.2	Tunnel Failure or Fire	Yes	There is a tunnel as part of the road design.	Road users	No	Yes - to review with design team	Yes - by design
7.3	Dam Failure	Yes	FRA	Road users	Likely to be covered in the FRA/Water chapter		
7.4	Flood Defence Failure	Yes	FRA - does consider breach assessments.	Road users	Likely to be covered in the FRA/Water chapter		
7.5	Mast and Tower Collapse	Yes	Design out through separation distances for wind turbines.	Road users	No	Possibly - to be reviewed with design team.	
7.6	Building failure or fire	No	No buildings close by		N/A		

7.7	Utilities failure (gas, electricity, water, sewage, oil, communications)	Yes	High pressure gas pipeline - check for others	Road users	No	Possibly - to be reviewed with design team.	
8	Industrial Accidents						
8.1	Defence industry	No	No defence manufacturing nearby	N/A			
8.2	Energy Industry (fossil fuel)	No	No petrochemical refinery, storage or power generation nearby	N/A			
8.3	Nuclear Power	No	None nearby	N/A			
8.4	Oil and gas refinery/storage	No	None nearby	N/A			
8.5	Food Industry	No	None nearby	N/A			
8.6	Chemical Industry	No	None nearby	N/A			
8.7	Manufacturing Industry	No	None nearby	N/A			
8.8	Mining Industry	Yes	Potential for current or past mining activity in the vicinity to lead to unstable ground conditions.	Road users	Yes - in the Geology and Soils assessment	Yes - likely to be in geotechnical design report.	
9	Terrorism/Crime/Civil unrest						
9.1	Bomb/vehicle attack on people	Yes	Possibility that inclusion of a tunnel will make the road more of a target for a terrorist attack?	Road users	No	Possibly - to be reviewed with design team.	
9.2	Bomb/vehicle attack on Infrastructure	Yes	Possibility that inclusion of a tunnel will make the road more of a target for a terrorist attack?	Road users			
9.3	Mass shooting	No	Unlikely to be more of a target for this type of incident due to low number of exposed targets.	N/A			
9.4	Chemical/gas attack	No	Unlikely to be more of a target for this type of incident due to low number of exposed targets.	N/A			
9.5	Rioting	No	Highly unlikely to occur in such a rural location.	N/A			
9.6	Cyber attacks	Yes	the increasing reliance on roadside technology could rendered the proposed scheme more vulnerable to a cyber attack.	Road users			
10	War						
10.1	Conventional	No	No more vulnerable than any other infrastructure.	N/A			
10.2	Chemical	No	No more vulnerable than any other infrastructure.	N/A			
10.3	Nuclear	No	No more vulnerable than any other infrastructure.	N/A			
11	Disease						
11.1	Human disease	No	No more vulnerable than any other infrastructure.	N/A			
11.2	Animal disease	No	No more vulnerable than any other infrastructure.	N/A			
11.3	Plant disease	No	No more vulnerable than any other infrastructure.	N/A			

Appendix C Landscape Viewpoints

Appendix C – Viewpoint List

VP No.	Visual Receptor	Description of view
1	<ul style="list-style-type: none"> Recreational users of PROW Residential properties in the northern periphery of Amesbury 	View north-west from the Lord's Walk footpath alongside the River Avon in the north of Amesbury
2	<ul style="list-style-type: none"> Residential properties along the A345 to the north of Countess Roundabout People working and visiting Countess Services Users of roads 	View south from the A345 at the exit to Countess Services on the north side of Countess Roundabout
3	<ul style="list-style-type: none"> Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site Users of recreational facilities, such as open access land 	View south-west from Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located in open access land approximately 100m west of Woodhenge monument
4	<ul style="list-style-type: none"> Recreational users of PROW, including walkers and equestrian users 	View south-east from Bridleway AMES9A west of the Halfmoon Clump
5	<ul style="list-style-type: none"> Residential properties in the western periphery of Amesbury Users of roads 	View north from a layby on Stonehenge Road, West Amesbury
6	<ul style="list-style-type: none"> Recreational users of PROW, including walkers and equestrian users Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site 	View south from Bridleway AMES9A north of the Nile Clumps

7	<ul style="list-style-type: none"> Recreational users of PROW, including walkers and equestrian users Residential properties in the southern periphery of Strangways 	View south-east from Bridleway AMES39 to the rear of properties at Strangways
8	<ul style="list-style-type: none"> Users of roads Recreational users of PROW 	View north-east from Stonehenge Road, West Amesbury
9	<ul style="list-style-type: none"> Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site Users of recreational facilities, such as open access land 	View west from the Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located at the eastern end of The Cursus
10	<ul style="list-style-type: none"> Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site 	View north from a tumulus on Coneybury Hill
11	<ul style="list-style-type: none"> Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site Recreational users of PROW, including walkers and equestrian users Users of recreational facilities, such as open access land 	View west from the Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located where The Avenue crosses King Barrow Ridge
12	<ul style="list-style-type: none"> Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site Recreational users of PROW, including walkers and equestrian 	View south-west from Bridleway AMES10 adjacent to the New King Barrows

	users <ul style="list-style-type: none"> • Users of recreational facilities, such as open access land 	
13	<ul style="list-style-type: none"> • Users of recreational facilities, such as open access land 	View south-west from The Avenue in open access land approximately 770m north-east of the Stonehenge Monument
14	<ul style="list-style-type: none"> • Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site • Recreational users of PROW, including walkers, cyclists, and equestrian users • Users of recreational facilities, such as open access land 	View south-east from the Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel located on Byway AMES12 adjacent to The Cursus
15	<ul style="list-style-type: none"> • Leisure and tourism visitors to the Stonehenge monument 	View east adjacent to the Stonehenge Monument
16	<ul style="list-style-type: none"> • Leisure and tourism visitors to the Stonehenge monument 	View south-west from a Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located to the south of the Stonehenge Monument
17	<ul style="list-style-type: none"> • Recreational users of PROW, including walkers, cyclists, and equestrian users • Users of recreational facilities, such as open access land 	View north-east from Byway AMES11 at Normanton Down
18	<ul style="list-style-type: none"> • Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site • Users of recreational facilities, such as open access land 	View south from the Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located at The Cursus Barrows
19a	<ul style="list-style-type: none"> • Recreational users of PROW, including walkers, cyclists, and equestrian users 	View east from Byway AMES12 close to the north side of the existing A303

	<ul style="list-style-type: none"> • Users of recreational facilities, such as open access land 	
19b	<ul style="list-style-type: none"> • Recreational users of PROW, including walkers, cyclists, and equestrian users • Users of recreational facilities, such as open access land 	View west from Byway AMES12 close to the north side of the existing A303
20	<ul style="list-style-type: none"> • Recreational users of PROW, including walkers, cyclists, and equestrian users 	View north-west from Byway WCLA1 south of Normanton Gorse
21	<ul style="list-style-type: none"> • Recreational users of PROW, including walkers, cyclists, and equestrian users 	View north from Byway WCLA1 south-east of The Diamond
22	<ul style="list-style-type: none"> • Users of roads • Users of recreational facilities, such as open access land 	View east from a layby on the A303 to the east of the Winterbourne Stoke Clump
23	<ul style="list-style-type: none"> • Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site • Users of recreational facilities, such as open access land 	View south-east from open access land east of the pedestrian access gate to the Winterbourne Stoke Group
24	<ul style="list-style-type: none"> • Leisure and tourism visitors to heritage features in the Stonehenge, Avebury and Associated Sites World Heritage Site • Users of recreational facilities, such as open access land 	View south-west from the Stonehenge, Avebury and Associated Sites World Heritage Site interpretation panel viewpoint located at the northern end of the Winterbourne Stoke Group
25	<ul style="list-style-type: none"> • Leisure and tourism visitors to the Stonehenge Visitor Centre 	View west from the Stonehenge Visitor Centre
26	<ul style="list-style-type: none"> • Users of roads • Recreational users of PROW, 	View north from the A360 adjacent to Restricted Byway BSJA9

	including walkers, cyclists, and equestrian users	
27	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users Scattered residential dwellings in the open downland areas 	View east from Byway WSTO6A adjacent to Hill Farm Cottages
28a	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View east from Byway WSTO6B just north of the A303
28b	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View west from Byway WSTO6B just north of the A303
29	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View south-west from Byway WSTO6B to the south of Foredown Barn
30	<ul style="list-style-type: none"> Scattered residential dwellings in the open downland areas 	View south-east from Byway WSTO4 as it crosses the River Till to the east of The Coniger Tumuli
31	<ul style="list-style-type: none"> Recreational users of PROW 	View north-west from Footpath WSTO11 between Hill Farm and Winterbourne Stoke
32	<ul style="list-style-type: none"> Residential properties in Winterbourne Stoke Visitors to the public house in Winterbourne Stoke Users of roads 	View north-east from the A303 River Till Road Bridge on the eastern edge of Winterbourne Stoke
33	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View south-east from Byway WSTO4 north of Winterbourne Stoke
34	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View south-east from Footpath WSTO4 north-west of The Coniger Tumuli

35	<ul style="list-style-type: none"> Residential properties in Winterbourne Stoke 	View north-east from the B3083 west of Winterbourne Stoke
36	<ul style="list-style-type: none"> Users of roads 	View south from the B3083 at the access point to the Natural England Offices of the Parsonage Down National Nature Reserve
37	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View north from Byway BSJA3 north-west of Berwick St James
38	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View north-east from Byway STAP5 on the boundary of the West Wiltshire Downs and Cranbourne Chase Area of Outstanding Natural Beauty
39	<ul style="list-style-type: none"> Users of roads 	View east from a layby on the A303, south of Parsonage Down National Nature Reserve
40	<ul style="list-style-type: none"> Users of recreational facilities, such as open access land 	View east from Parsonage Down National Nature Reserve
41	<ul style="list-style-type: none"> Recreational users of PROW, including walkers, cyclists, and equestrian users 	View east from Byway BSJA4 to the east of Yarnbury Camp
42	<ul style="list-style-type: none"> Users of roads Users of recreational facilities, such as open access land 	View west from a footpath alongside the existing A303, between King Barrow Ridge and Stonehenge Bottom

Figures

Figure 2.1 – Scheme Location

Figure 3.1 – Option Identification and Selection Process

Figure 6.1 – Heritage

Figure 6.2 – 5km ZTV

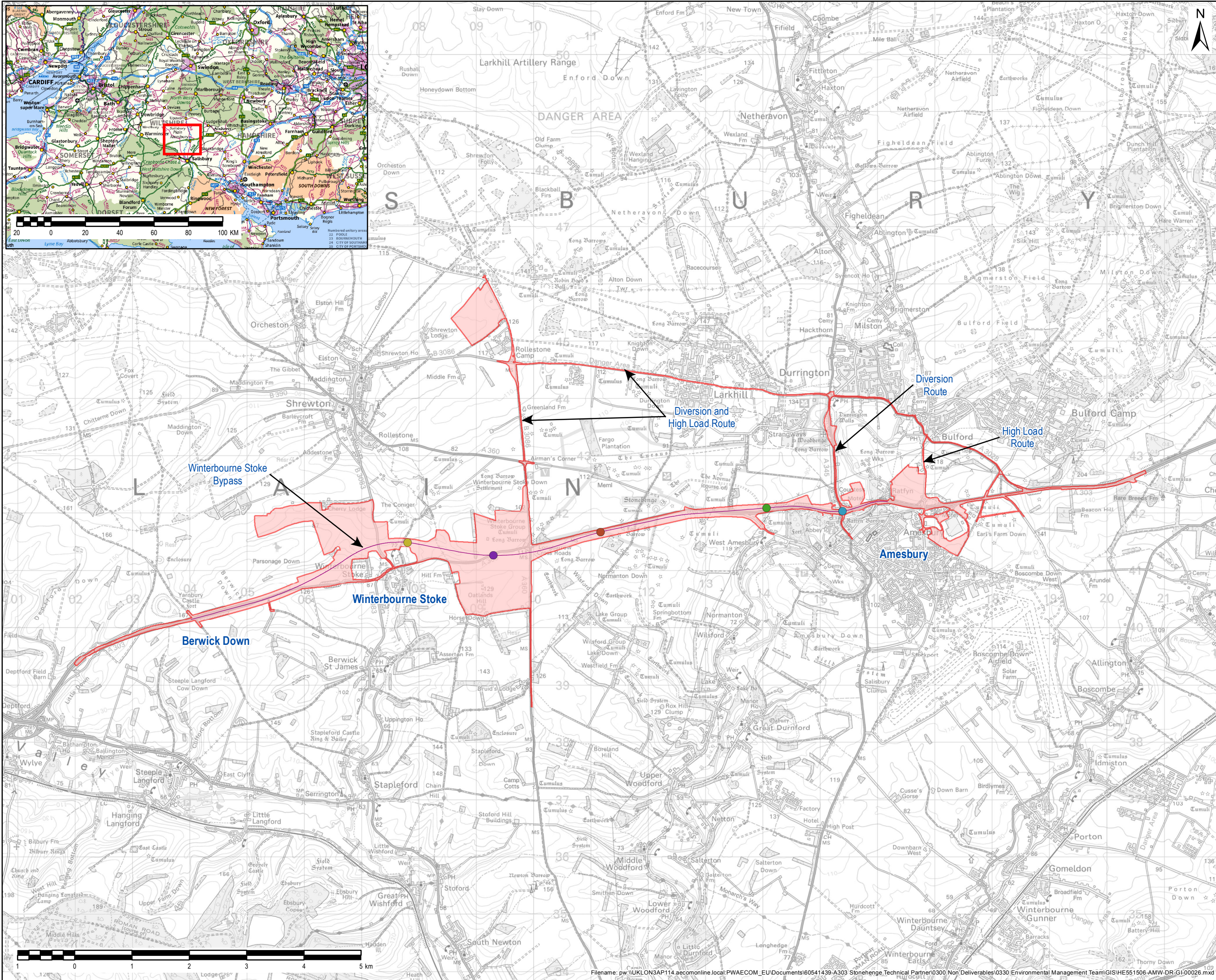
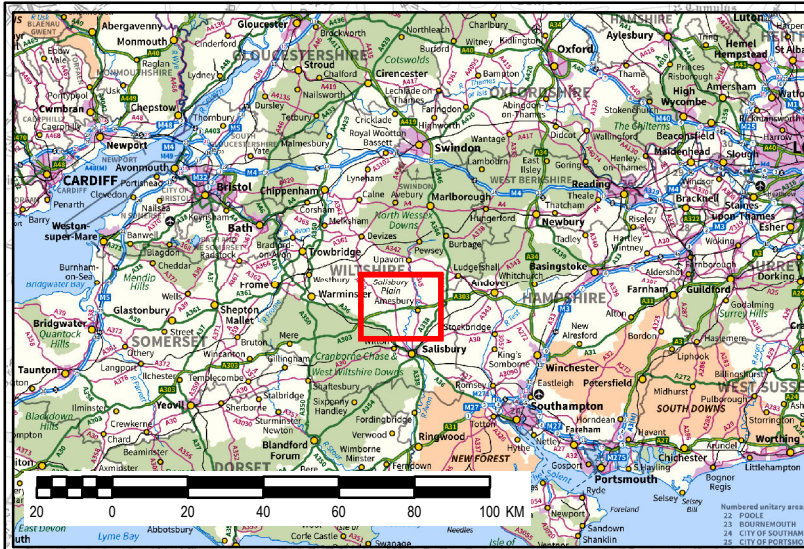
Figure 6.3 – 2km ZTV

Figure 6.4 – Landscape Constraints

Figure 6.5 – Ecology Features

Figure 6.6 – Waste Hierarchy (refer to page 114)

Figure 6.7 – Water Features



NOTES / LEGEND

- Indicative centreline for the purposes of EIA scoping
- Proposed draft DCO site boundary

Locations are indicative for the purpose of EIA

- Location of the Eastern portal
- Location of the Western portal
- Location of the Countess junction
- Location of the Longbarrow junction
- Location of the River Till crossing

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AMESBURY TO BERWICK DOWN

Drawing Title

FIGURE 2.1
LOCATION OF THE SCHEME

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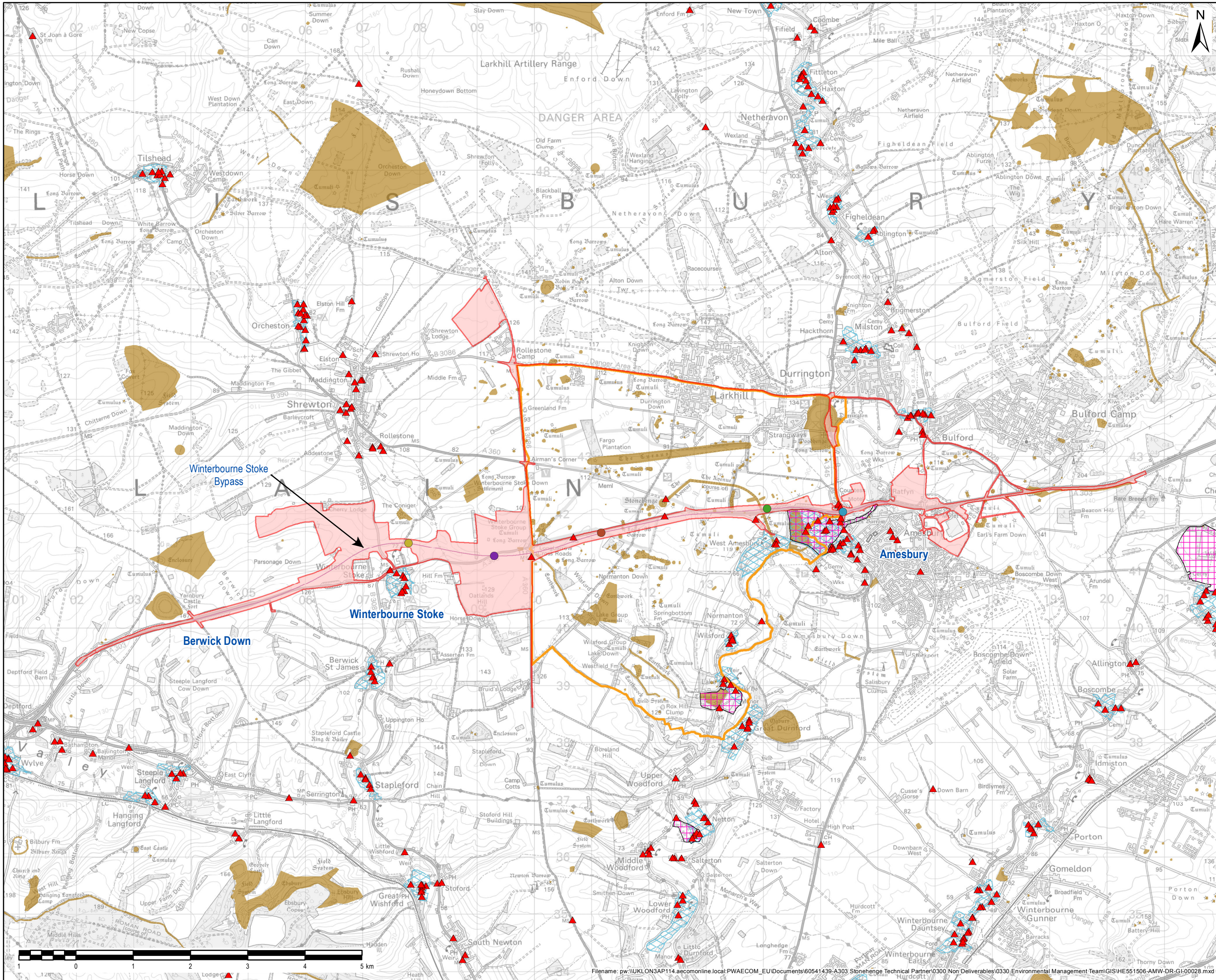
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Scheme Wide	GN	GI	00026				
Location		Type	Role				



- NOTES / LEGEND
- Indicative centreline for the purposes of EIA scoping
 - Proposed draft DCO site boundary
 - Listed Building
 - World Heritage Site
 - Registered Parks and Gardens
 - Conservation Area
 - Scheduled Monument
- Locations are indicative for the purpose of EIA Scoping
- Location of the Eastern portal
 - Location of the Western portal
 - Location of the Countess junction
 - Location of the Longbarrow junction
 - Location of the River Till crossing

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AMESBURY TO BERWICK DOWN

Drawing Title
FIGURE 6.1A
HERITAGE FEATURES

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HS	GM	CC	WB	19/10/17

Internal Project No.
60541439

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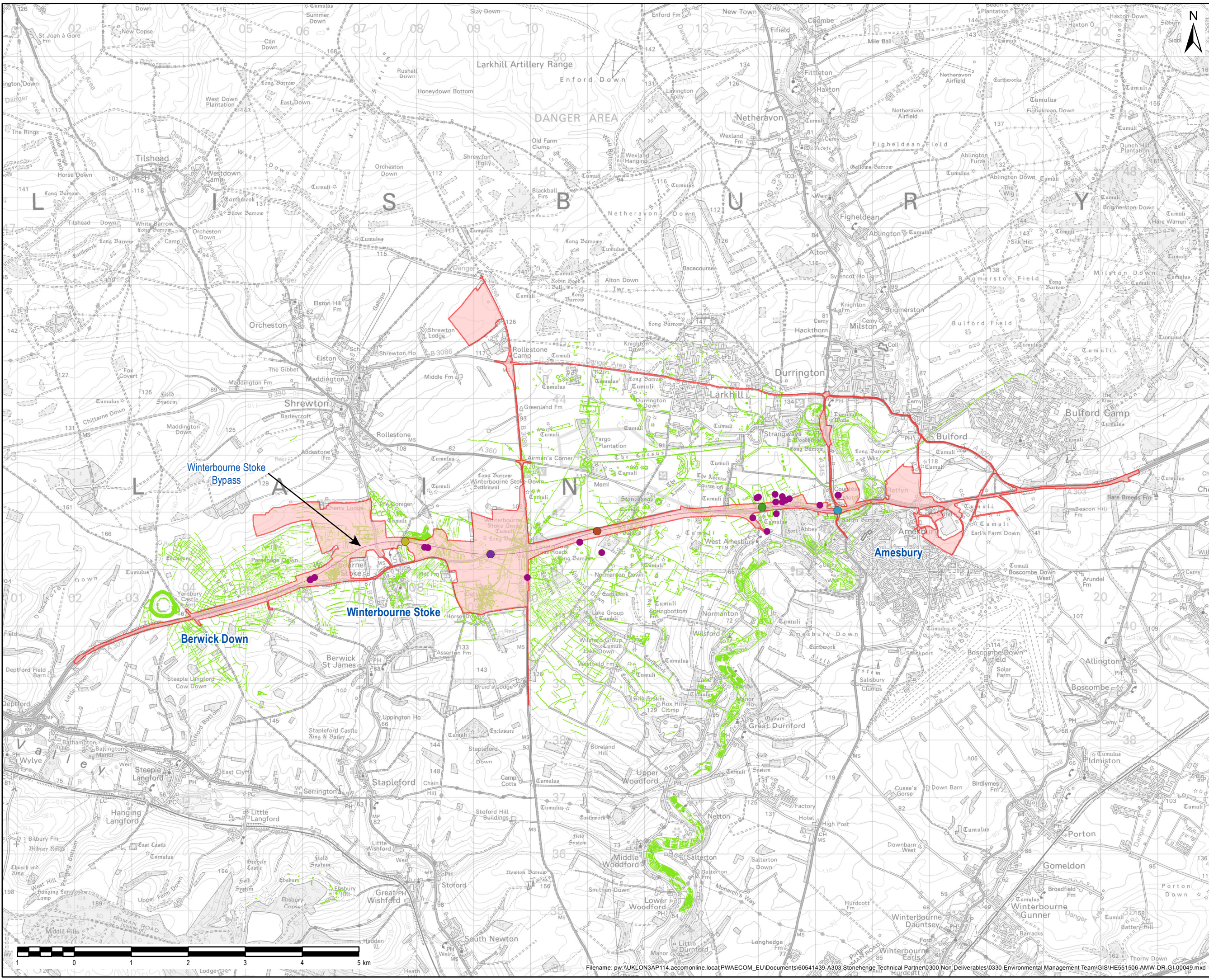
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HE551506	AMW	AMW	GEN	01
Location	Scheme Wide	GN	GI	00028



NOTES / LEGEND

- Indicative centreline for the purposes of EIA scoping
- Proposed draft DCO site boundary
- Non designated HER monument (point)
- Non designated HER monument (line)
- Non designated HER monument (polygon)

Locations are indicative for the purpose of EIA

- Location of the Eastern portal
- Location of the Western portal
- Location of the Countess junction
- Location of the Longbarrow junction
- Location of the River Till crossing

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AMESBURY TO BERWICK DOWN

Drawing Title

FIGURE 6.1B
HERITAGE FEATURES

Designed	HS	Drawn	GM	Checked	CC	Approved	WB	Date	19/10/17
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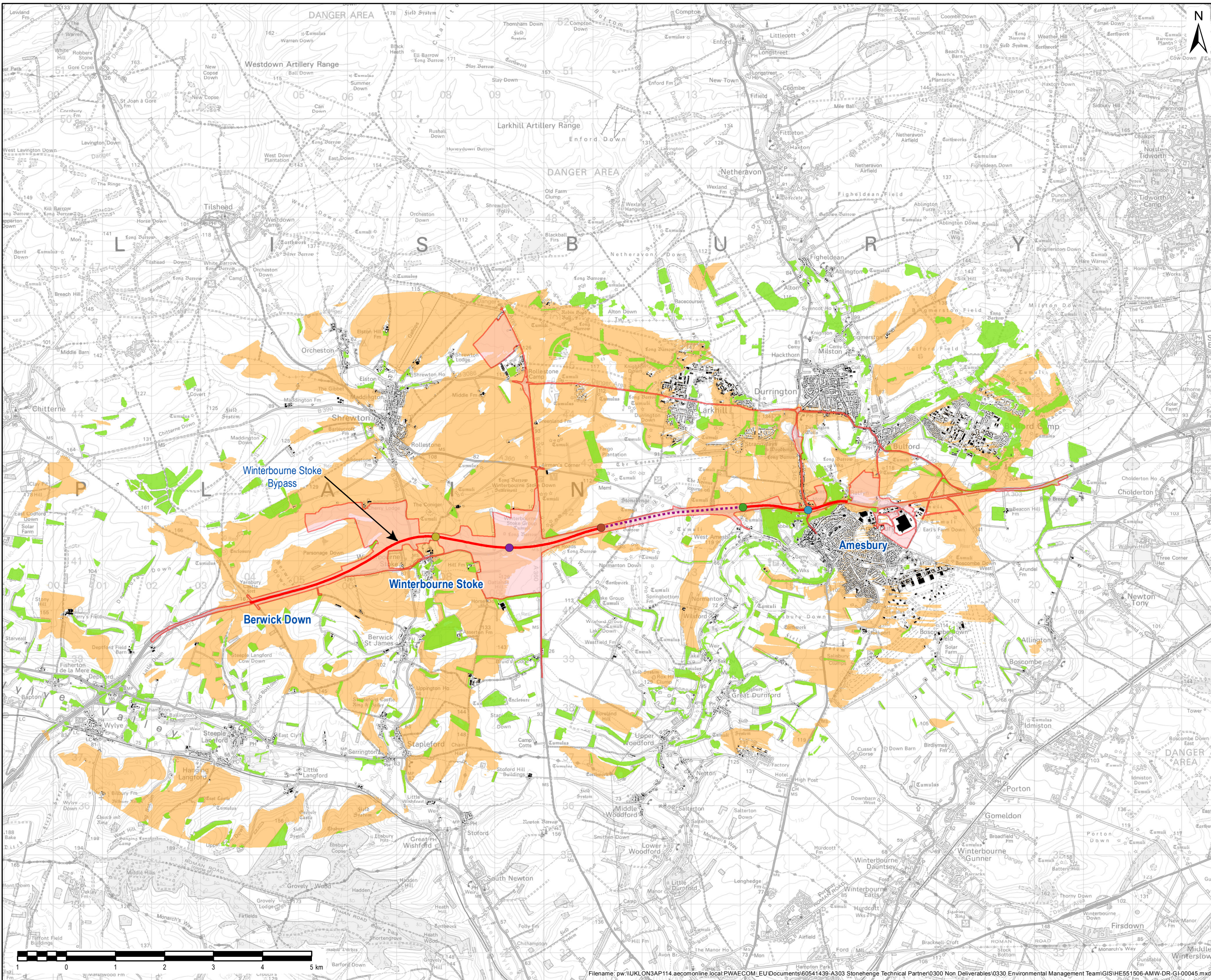
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HE551506	AMW	GEN	01	

SCHEME WIDE	GN	GI	00049
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Location	Type	Role	Number
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NOTES / LEGEND

- Indicative centreline for the purposes of EIA scoping
- Proposed tunnel (not modelled)
- Proposed draft DCO site boundary
- Building (8m – sourced from OS MasterMap)
- Woodland (10m – sourced from National Forest Inventory)

Zone of Theoretical Visibility (ZTV) of traffic along the Proposed A303, modelled at a height of 4m above the proposed carriageway to represent heavy goods vehicles. Proposed scheme earthworks including sections where the road is in cutting or on embankment have been incorporated into the Digital Terrain Model to model the effect of the proposed carriageway

Locations are indicative for the purpose of EIA Scoping

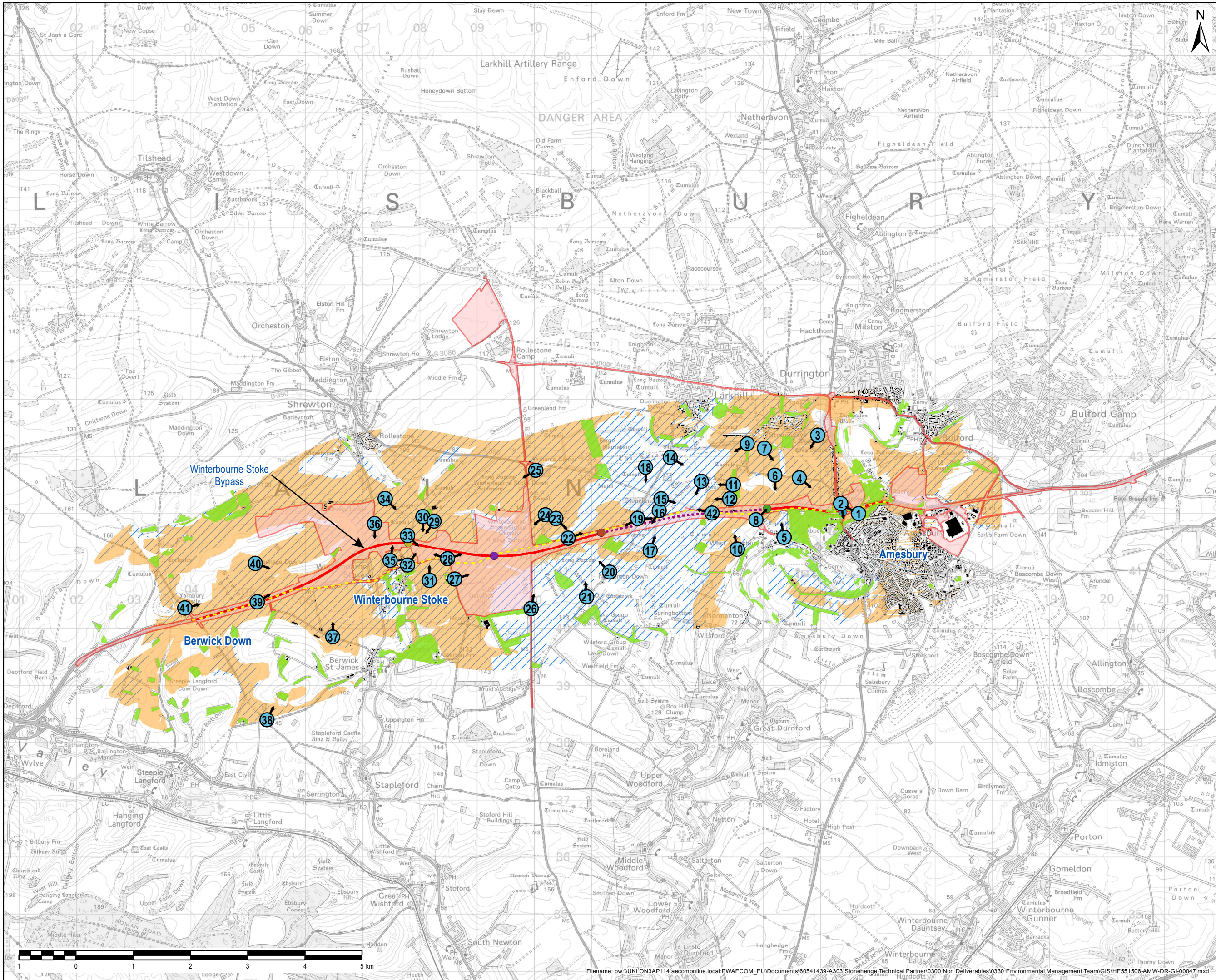
- Location of the Eastern portal
- Location of the Western portal
- Location of the Countess junction
- Location of the Longbarrow junction
- Location of the River Till crossing

Based on 5m resolution Digital Terrain Model, incorporating woodland, buildings and proposed scheme earthworks. Woodland derived from Forestry Commission National Forestry Inventory, modelled at 10m. Buildings derived from OS Mastermap, modelled at 8m. Proposed scheme earthworks taken from the highways model design freeze for scoping. Proposed centreline, excluding the proposed tunnel, modelled at 4m.

ZTV modelled for the Proposed A303 Scheme Centreline only. Further ZTVs for construction laydown areas and road junctions will be prepared as detail of these sites are developed and the study area adjusted accordingly.

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Project Title		A303 STONEHENGE AMESBURY TO BERWICK DOWN			
Drawing Title		FIGURE 6.2 5KM ZONE OF THEORETICAL VISIBILITY (ZTV) INCORPORATING BUILDINGS, WOODLAND AND PROPOSED SCHEME EARTHWORKS			
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Approved	TR	Date	19/10/17		
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SCHEME WIDE		GN		GI 00045	
Location		Type		Role	
				Number	



NOTES / LEGEND

Indicative centreline for the purposes of EIA scoping

Proposed tunnel (not modelled)

Proposed draft DCO site boundary

Existing A303

Building (8m – sourced from OS MasterMap)

Woodland (10m – sourced from National Forest Inventory)

Zone of Theoretical Visibility (ZTV) of traffic along the Proposed A303, modelled at a height of 4m above the proposed carriageway to represent heavy goods vehicles. Proposed scheme earthworks including sections where the road is in cutting or on embankment have been incorporated into the Digital Terrain Model to model the effect of the proposed carriageway

Zone of Theoretical Visibility (ZTV) of Existing A303, modelled at a height of 4m above the existing carriageway to represent heavy goods vehicles

Proposed Representative Viewpoint

Locations are indicative for the purpose of EIA Scoping

Location of the Eastern portal

Location of the Western portal

Location of the Countess junction

Location of the Longbarrow junction

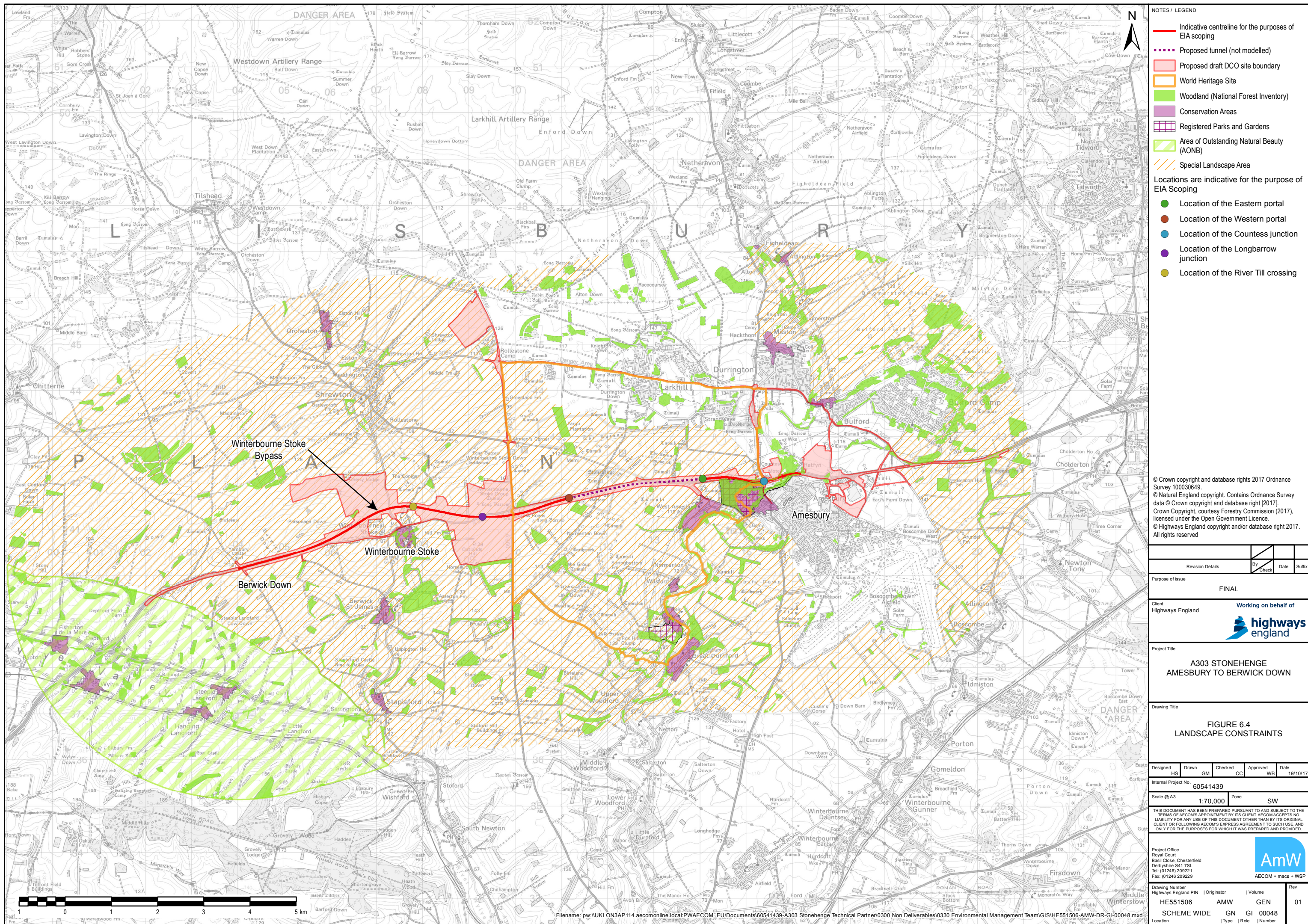
Location of the River Till crossing

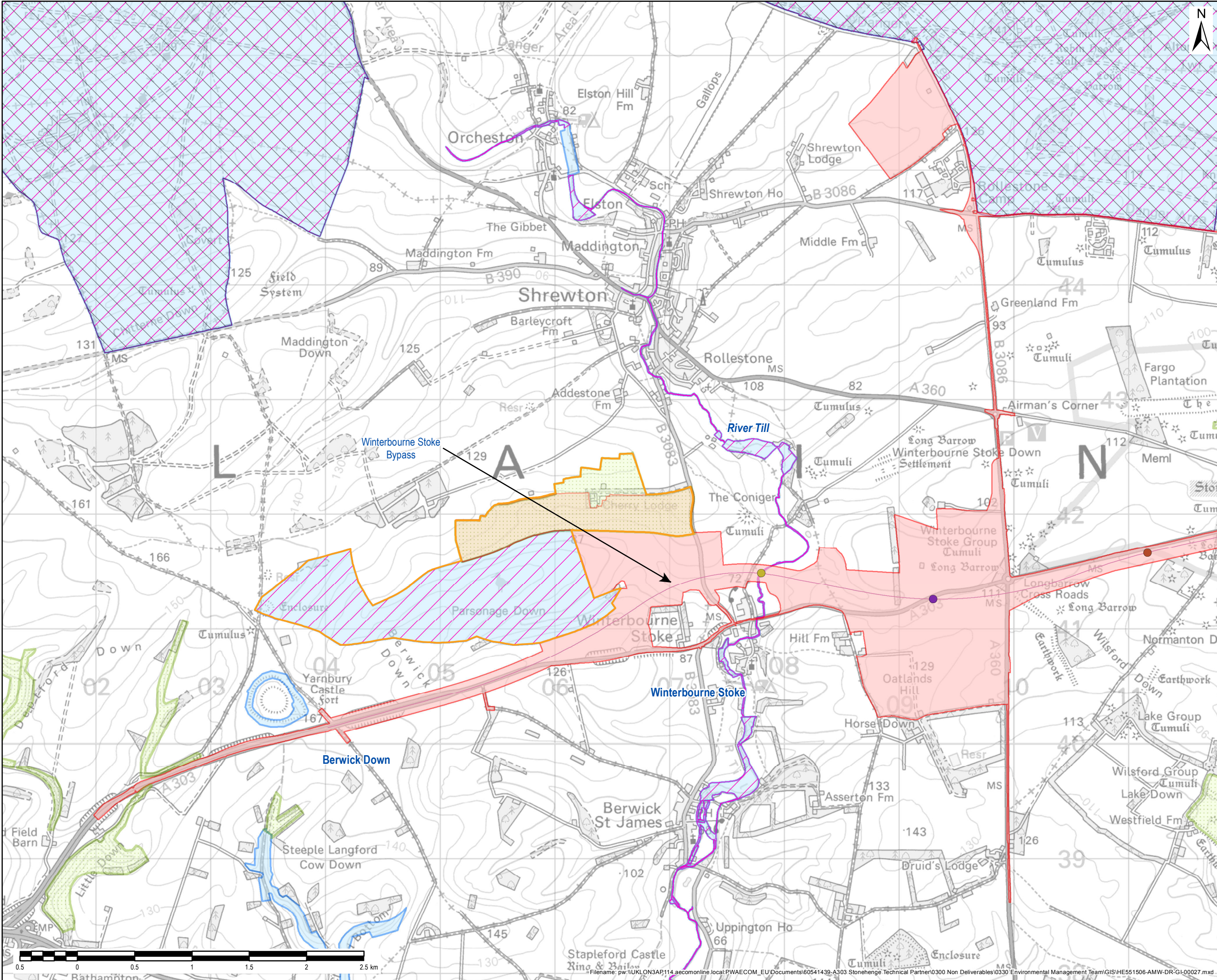
Based on 5m resolution Digital Terrain Model, incorporating woodland, buildings and proposed scheme earthworks. Woodland derived from Forestry Commission National Forestry Inventory, modelled at 10m. Buildings derived from OS Mastermap, modelled at 8m. Proposed scheme earthworks taken from the highways model design freeze for scoping. Proposed centreline, excluding the proposed tunnel, modelled at 4m.

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Client	Working on behalf of								
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Project Title	A303 STONEHENGE AMESBURY TO BERWICK DOWN								
Drawing Title	FIGURE 6.3 2KM ZONE OF THEORETICAL VISIBILITY (ZTV) INCORPORATING BUILDINGS, WOODLAND AND PROPOSED SCHEME EARTHWORKS AND SHOWING REPRESENTATIVE VIEWPOINT LOCATIONS								
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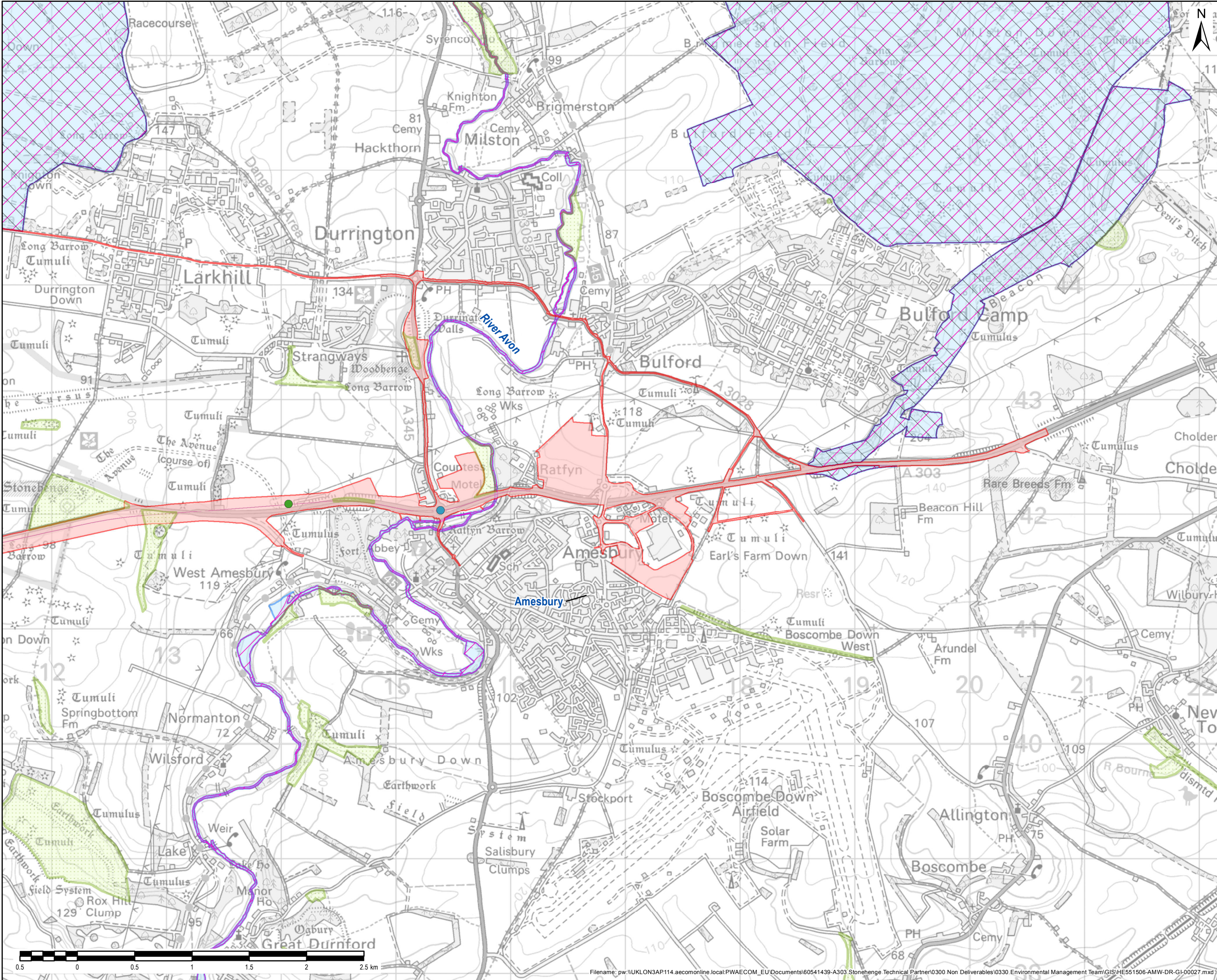
- Indicative centreline for the purposes of EIA scoping
- Proposed draft DCO site boundary
- National Nature Reserve (NNR)
- County Wildlife Sites (CWS)
- Special Protection Areas (SPA)
- Special Areas of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)

Locations are indicative for the purpose of EIA Scoping

- Location of the Western portal
- Location of the Longbarrow junction
- Location of the River Till crossing

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Project Title	A303 STONEHENGE AMESBURY TO BERWICK DOWN								
Drawing Title	FIGURE 6.5A KEY ECOLOGICAL FEATURES								
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Internal Project No.	60541439								
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Location Type Role Number									



NOTES / LEGEND

- Indicative centreline for the purposes of EIA scoping
- Proposed draft DCO site boundary
- County Wildlife Sites (CWS)
- Special Protection Areas (SPA)
- Special Areas of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)

Locations are indicative for the purpose of EIA Scoping

- Location of the Eastern portal
- Location of the Countess junction

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FIGURE 6.5B
KEY ECOLOGICAL FEATURES

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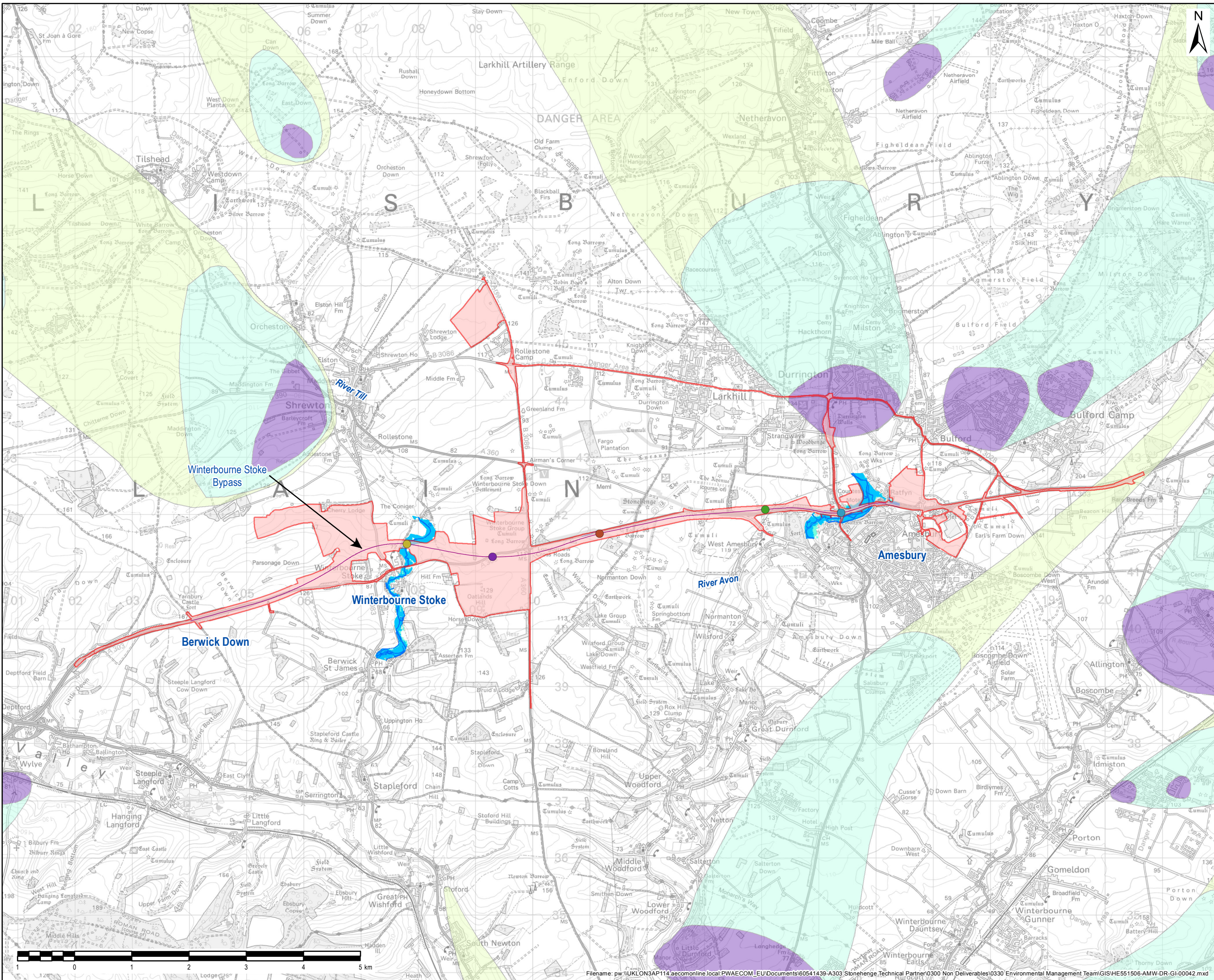
00027

Location

Type

Role

Number



- NOTES / LEGEND
- Indicative centreline for the purposes of EIA scoping
 - Proposed draft DCO site boundary
 - Surface water area feature
 - Flood Zone 3
 - Flood Zone 2
 - Source Protection Zone 1
 - Source Protection Zone 2
 - Source Protection Zone 3
- Locations are indicative for the purpose of EIA Scoping
- Location of the Eastern portal
 - Location of the Western portal
 - Location of the Countess junction
 - Location of the Longbarrow junction
 - Location of the River Till crossing

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**FIGURE 6.7
KEY WATER FEATURES**

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