

High Speed Rail (West Midlands - Crewe)

Supplementary Environmental Statement 2 and
Additional Provision 2 Environmental Statement

Volume 3

Route-wide effects

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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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A report prepared for High Speed Two (HS2) Limited:

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Structure of the HS2 Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

This report is part of the suite of documents that make up the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES) for Phase 2a of the High Speed Two (HS2) rail network between the West Midlands and Crewe. The SES2 and the AP2 ES are separate documents, however, they are bound together and presented in a number of volumes described below and shown in Figure 1:

- Non-technical summary (NTS). This provides a summary in non-technical language of the SES2 (Part 1) and the AP2 ES (Part 2). It presents a summary of any likely residual significant environmental effects (i.e. effects which are likely to remain after mitigation measures are put in place), both beneficial and adverse, which are new or different to those reported in the Environmental Statement (ES) submitted to Parliament in July 2017 in support of the hybrid Bill for Phase 2a of HS2 ('the main ES'), as amended by the Supplementary Environmental Statement 1 (SES1) submitted in March 2018 (and by SES2 for the AP2 amendments). The AP1 amendments described in the AP1 ES submitted in March 2018 are also taken into account where relevant;
- Glossary of terms and list of abbreviations. This contains any new or different terms and abbreviations used throughout the SES2 and the AP2 ES which are not already explained in the main ES or the SES1 and the AP1 ES;
- Volume 1: Introduction to the SES2 and the AP2 ES. This introduces the supplementary environmental information and changes to the design and construction assumptions included within the SES2 and amendments within the AP2 ES. The report explains the environmental impact assessment (EIA) process that has been applied;
- Volume 2: Community area reports and map books. These report the supplementary environmental information and changes to the design and construction assumptions included within the SES2 (Part 1), amendments within the AP2 ES (Part 2) and any new or different likely significant environmental effects arising from these changes and amendments in each community area. These effects are compared to those reported in the main ES, as amended by the SES1 (and by the SES2 for the AP2 amendments). The AP1 amendments are also taken into account where relevant. The maps relevant to each community area are provided in separate Volume 2 map books and should be read in conjunction with the relevant community area report;
- Volume 3: Route-wide effects. This describes any new or different likely significant environmental effects arising at a route-wide level from the supplementary environmental information and changes to the design and construction assumptions included within the SES2 (Part 1) and the

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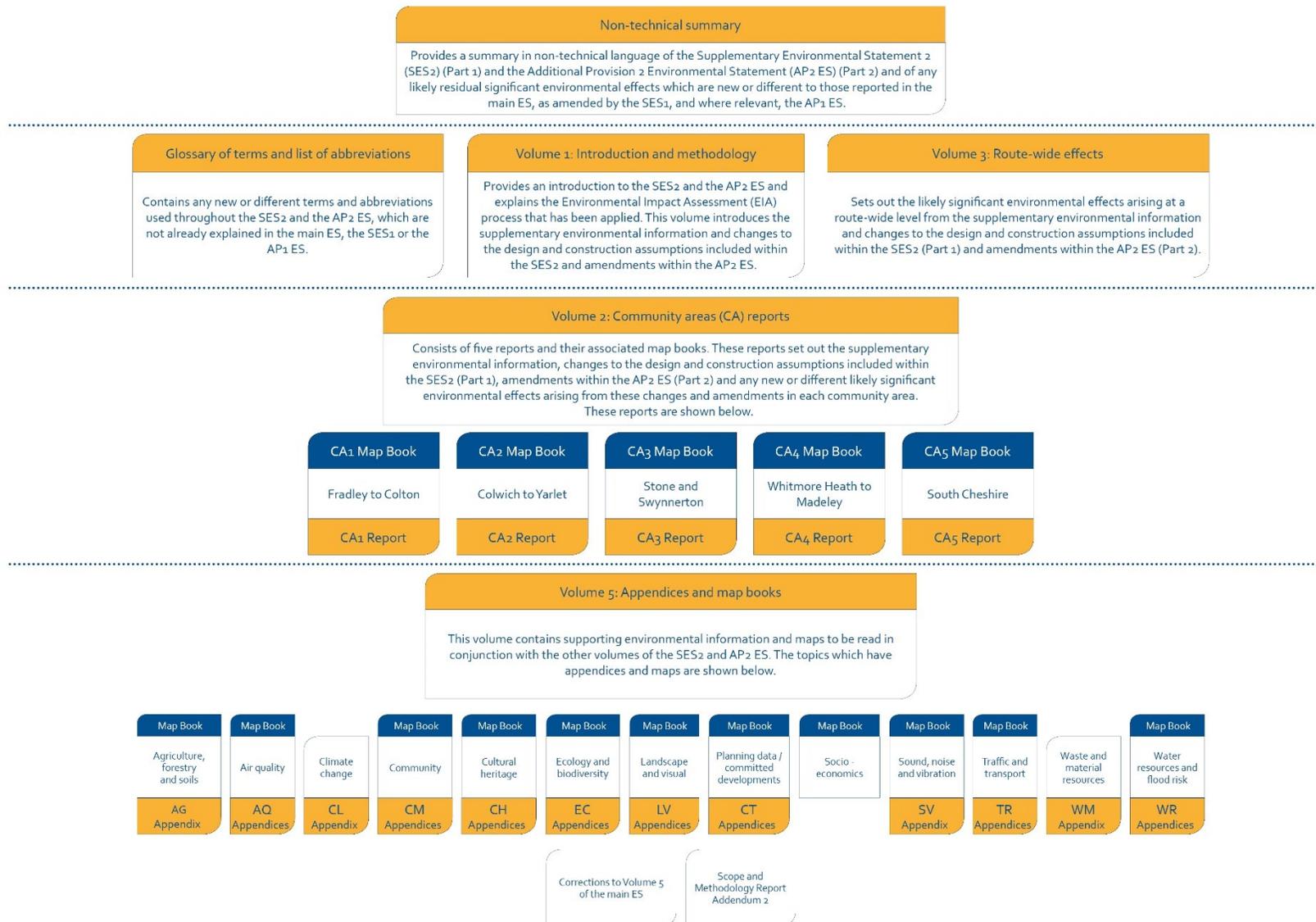
amendments within the AP2 ES (Part 2) compared to those reported in the main ES, as amended by the SES1 (and by SES2 for the AP2 amendments). The AP1 amendments are also taken into account where relevant; and

- Volume 5: Appendices and map book. These contain supporting environmental information and associated maps.

A Volume 4: Off-route effects report was produced as part of the main ES. This assessed the likely significant effects of the scheme at locations beyond the Phase 2a route corridor and its immediate environment. A separate Volume 4 has not been produced as part of the SES2 and AP2 ES. Any new or different significant off-route effects arising from the SES2 changes and AP2 amendments are reported in the most relevant Volume 2 Community area report.

Certain reports and maps containing background information and data (BID) have been produced, which do not form part of the SES2 and AP2 ES. These documents are available online at www.gov.uk/hs2. The BID documents and maps present background survey information and other relevant background material.

Figure 1: Structure of the SES2 and AP2 ES



1 Introduction

1.1 The SES₂ and AP₂ ES

- 1.1.1 The High Speed Rail (West Midlands - Crewe) Bill was submitted to Parliament together with the main ES in July 2017. The SES₁ and AP₁ ES, which was submitted in March 2018, updated the main ES and contained a number of changes and amendments to the design of the original scheme (i.e. the scheme submitted in July 2017).
- 1.1.2 Since the submission of the main ES, SES₁ and AP₁ ES, the need for further changes to the design and construction assumptions has been identified. New environmental baseline has also become available and the need for a number of corrections to the main ES has been identified. Any new or different significant effects that are likely to result from these changes, where these do not require amendments to the Bill, are reported in the SES₂.
- 1.1.3 Changes to the Bill are needed in order to make further amendments to the original proposals and these require the submission of a second Additional Provision ('AP₂'). Some of the AP₂ amendments alter certain of the proposals within AP₁. The AP₂ ES reports on the likely significant environmental effects of these amendments, having taken into account the environmental information in the SES₂.
- 1.1.4 These amendments and design changes have arisen through the Select Committee process, ongoing discussions with stakeholders and as a result of design refinements.
- 1.1.5 The SES₂ and the AP₂ ES are separate environmental statements, but have been produced as combined volumes. Both the SES₂ and AP₂ ES provide an update to the main ES, as amended by the SES₁ and, where relevant, the AP₁ ES, and should be read in conjunction with them. The SES₂ is presented first, and the AP₂ ES follows and bases its comparison upon effects reported in the main ES, as amended by the SES₁ and SES₂. The assessment also reports the likely significant cumulative effects, taking into account the AP₁ amendments.
- 1.1.6 The Bill and associated Additional Provisions (APs) to the Bill described above, if enacted by Parliament, will provide the powers to construct, operate and maintain Phase 2a of HS₂.

1.2 Terminology used to describe the scheme

- 1.2.1 In order to differentiate between the original proposals assessed as part of the main ES and subsequent changes, the following terms are used throughout the SES₂ and the AP₂ ES to define the scheme as it relates to the HS₂ Phase 2a project:
- 'the original scheme' – the Bill scheme submitted to Parliament in July 2017, which was assessed in the main ES;
 - 'the SES₁ scheme' – the original scheme with the changes described in the SES₁ submitted in March 2018;
 - 'the AP₁ revised scheme' – the SES₁ scheme as amended by the AP₁ submitted in March 2018;

- 'the SES2 scheme' – the SES1 scheme with the changes described in the SES2; and
- 'the AP2 revised scheme' – the SES2 scheme as amended by the AP2.

1.2.2 The following terms are used to differentiate between changes included in the SES2 and those included in the AP2 ES:

- 'SES2 design changes' – changes to the scheme design reported in the SES2 that do not require additional powers. In this report the term 'design change' is also used;
- 'SES2 changes' – all changes reported in the SES2 that do not require additional powers. These may include new baseline information, changes to the design and construction assumptions, and corrections; and
- 'AP2 amendments' – amendments to the scheme reported in the AP2 ES that include requirements for additional powers in the Bill. In this report the term 'amendment' is also used;

1.2.1 In addition, the following terms are also used in the SES2 and AP2 ES, where relevant:

- 'SES1 design changes' – changes to the scheme design reported in the SES1 that do not require additional powers;
- 'SES1 changes' – all changes reported in the SES1 that do not require additional powers. These may include new baseline information, changes to the design and construction assumptions, and corrections; and
- 'AP1 amendments' – amendments to the scheme reported in the AP1 ES that include requirements for additional powers in the Bill.

1.3 Scope of this report

1.3.1 SES2 changes and AP2 amendments have been considered to determine their potential to give rise to any new or different likely significant route-wide environmental effects. Route-wide effects reported in this volume are those considered to be appropriately assessed at a geographical scale greater than that presented within Volume 2 of the SES2 and AP2 ES.

1.3.2 The route-wide effects, depending on the type of change, are reported in SES2 (Part 1) or AP2 ES (Part 2) of this document, which are in turn divided into environmental topics.

1.3.3 Part 1 of this report describes any new or different likely significant route-wide effects as a result of the SES2 changes compared to those reported in the main ES, as amended by SES1 taking into account AP1 amendments where relevant.

1.3.4 Part 2 reports any new or different likely significant route-wide effects as a result of the AP2 amendments compared to those reported in the main ES, as amended by SES1 and SES2, taking into account AP1 amendments where relevant. Part 2 also presents a summary of the combined impacts of Phase One, Phase 2a and Phase 2b,

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taking into account all SES changes and AP amendments (i.e. SES1 changes, SES2 changes, AP1 amendments and AP2 amendments).

- 1.3.5 A number of environmental topics have been scoped out of further route-wide assessment. This is where effects arising from the SES2 changes and AP2 amendments are localised in extent and no new or different likely significant route-wide effects have been identified. The environmental topics scoped out from SES2 are: agriculture, forestry and soils; air quality; community; cultural heritage; health; land quality; landscape and visual; socio-economics; sound, noise and vibration; and traffic and transport. The environmental topics scoped out from the AP2 ES are: air quality; community; cultural heritage; health; land quality; landscape and visual; socio-economics; sound, noise and vibration; and traffic and transport.
- 1.3.6 For those topics where it was considered that there was the potential for new or different likely significant route-wide effects as a consequence of the SES2 changes and AP2 amendments, further assessment has been carried out. As a result, for SES2, ecology and biodiversity and water resources and flood risk are reported. For the AP2 ES, the following environmental topics are considered: agriculture, forestry and soils; ecology and biodiversity; and water resources and flood risk. In each of these sections, the environmental topic is introduced and conclusions are presented.
- 1.3.7 The climate change, major accidents and natural disasters, and waste and material resources assessments are reported only at a route-wide level rather than within the community area reports (Volume 2) of the SES2 and AP2 ES. This follows the approach taken in the main ES and the SES1 and AP1 ES. For these route-wide topics, assessment has been carried out to determine whether there are any new or different likely significant route-wide effects as a consequence of the SES2 changes and AP2 amendments.
- 1.3.8 The methodology for each environmental topic assesses effects in a different way appropriate to that environmental topic, therefore the approach to assessment of route-wide effects varies between environmental topics. The Scope and Methodology Report (SMR) (see Volume 5: CT-001-001 of the main ES)¹, the SMR Addendum (see Volume 5: CT-001-002 of the main ES)² and the SMR Addendum 2 (see Volume 5: Appendix CT-001-000 of the SES2 and AP2 ES) presents the basis of the route-wide assessment for each topic.
- 1.3.9 The standard measures that will be used to mitigate likely significant adverse environmental effects during the construction and operation of the scheme are described in the main ES, Volume 1, Section 9 and the draft Code of Construction Practice (CoCP) (see Volume 5: CT-003-000 of the main ES)³ submitted in support of

¹ HS2 Ltd (2017). *High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement, Volume 5: Technical appendices, Environmental Impact Assessment Scope and Methodology Report (Appendix CT-001-001)*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627187/E23_EIA_SMR_CT-001-001_WEB.pdf

² HS2 Ltd (2017). *High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement, Volume 5: Technical appendices, Environmental Impact Assessment Scope and Methodology Report Addendum (Appendix CT-001-002)*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627189/E24-B_CT-001-002_Part_B_WEB.pdf

³ HS2 Ltd (2017). *High Speed Rail (West Midlands - Crewe) Environmental Statement, Volume 5: Technical appendices, draft Code of Construction Practice (CT-003-000)*, <https://www.gov.uk/government/publications/draft-code-of-construction-practice-for-hs2-phase-2a>

the Bill. Implementation of these measures has been assumed in this SES2 and AP2 ES.

- 1.3.10 Following the approach taken in the main ES, committed developments are considered within the assessments, but only referred to if there is the potential for new or different likely significant route-wide cumulative effects.

1.4 Structure of this report

1.4.1 The report is structured as follows:

- Section 1: Introduction;

Part 1: Supplementary Environmental Statement 2

- Section 2: Climate change;
- Section 3: Ecology and biodiversity;
- Section 4: Major accidents and natural disasters;
- Section 5: Waste and material resources;
- Section 6: Water resources and flood risk;
- Section 7: Phase One, Phase 2a and Phase 2b combined impacts;

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- Section 8: Agriculture, forestry and soils;
- Section 9: Climate change;
- Section 10: Ecology and biodiversity;
- Section 11: Major accidents and natural disasters;
- Section 12: Waste and material resources;
- Section 13: Water resources and flood risk; and
- Section 14: Phase One, Phase 2a and Phase 2b combined impacts.

Part 1: Supplementary Environmental Statement 2

2 Climate change

2.1 Introduction

- 2.1.1 Volume 3 of the main ES reported the assessment of the greenhouse gas (GHG) emissions of the original scheme during construction and operation. It also reported the assessment of in-combination climate change impacts and climate change resilience during construction and operation.
- 2.1.2 Volume 3 of SES₁ reported that the SES₁ changes were not considered to result in a material difference to the GHG assessment and that there would be no change to the outcome of the in-combination climate change impacts assessment or the climate change resilience assessment presented in Volume 3 of the main ES.
- 2.1.3 This section of the report identifies any material changes to the assessment reported in Volume 3 of the main ES as amended by SES₁, due to the SES₂ changes.

2.2 Changes to the assessment

- 2.2.1 The SES₂ changes are not considered to result in a material difference to the GHG assessment presented in Volume 3 of the main ES, as amended by SES₁.
- 2.2.2 The assessment also determined that there would be no change to the outcome of the in-combination climate change impacts assessment or the climate change resilience assessment arising from the SES₂ changes.

3 Ecology and biodiversity

3.1 Introduction

- 3.1.1 Volume 3 of the main ES reported the impacts and likely significant effects on ecological resources that will occur at a route-wide level as a consequence of the construction and operation of the original scheme. The route-wide assessment addressed significant effects at the regional and national level, and in-combination effects not discussed within Volume 2 of the main ES.
- 3.1.2 Volume 3 of SES1 reported that any variations as a result of the SES1 changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 3.1.3 This section of the report identifies any new or different likely significant effects compared to those reported in Volume 3 of the main ES, as amended by SES1, due to the SES2 changes.

3.2 Changes to the assessment

Designated sites

Statutory designations

- 3.2.1 The SES2 changes will not result in any new or different likely significant effects on statutory designated nature conservation sites compared to those reported in Volume 3 of the main ES, as amended by SES1.

Non-statutory designations

- 3.2.2 A total of seven newly-designated non-statutory nature conservation sites (five new Local Wildlife Sites (LWS) and two new Biodiversity Alert Sites (BAS)) have been identified as relevant to the SES2 scheme. In addition, the status of eight other relevant non-statutory designations has been amended. Information including impacts on the newly-designated sites is provided in the following sections and listed in Table 1 and Table 2 and further details of all the changes are provided in SES2 and AP2 ES Volume 5: Appendix EC-001-000 and Map Series EC-01.

Local Wildlife Sites

Table 1: New LWS relevant to the SES2 scheme

Site name	CA	Change	Impact type
Pipe Wood	1	New LWS, previously Ancient Woodland Inventory Site (AWIS) only	Adjacent to SES2 scheme - indirect
Moss Rose Barn (Western Field)	3	New LWS, no previous designation	Adjacent to SES2 scheme – indirect
Hey Sprink (South)	4	New LWS, previously AWIS only	Partially within SES2 scheme - direct
Hey Sprink	4	New LWS, previously AWIS only	Adjacent to SES2 scheme - indirect
Randilow and Bunker Hill	5	New LWS, no previous designation	Partially within SES2 scheme - direct

- 3.2.3 Direct impacts to the two new LWS (Hey Sprink (South) and Randilow and Bunker Hill LWS) are not considered to represent a significant change to route-wide effects on LWS. Potential adverse effects to the constituent habitats of these directly affected newly-designated sites was considered in the main ES. No new or different significant effects are anticipated to the new LWS located adjacent to the SES2 scheme.

Biodiversity Alert Sites

Table 2: New BAS impacted by SES2 scheme

Site name	CA	Change	Impact type
Cash's Pit	3	New BAS, no previous designation	Within SES2 scheme – direct
Swynnerton Heath Farm (East of)	3	New BAS, no previous designation	Partially within SES2 scheme – direct

- 3.2.4 Direct impacts to two additional BAS are not considered to represent a significant change to route-wide effects on BAS. Potential adverse effects to the constituent habitats of these newly-designated sites was considered in the main ES.
- 3.2.5 Total numbers of non-statutory nature conservation sites affected by the SES2 scheme are summarised in Table 3. These changes take into account the newly-designated sites, as well as the amended status of two sites from LWS to BAS (Lodge Covert and Closepit Plantation, both in CA3) and of one site from BAS to LWS (Wrinehill Wood (East of) in CA4).

Table 3: Total number of designated sites impacted by the SES2 scheme, by county

County	Designation type	No. of sites impacted at main ES/ SES1	No. of sites impacted at SES2	No. of type in county	% of sites impacted
Staffordshire	LWS	15	14	932	1.5%
	BAS	8	11	478 ⁴	2.3%
Cheshire	LWS	0	1	1032 ⁵	0.1%

- 3.2.6 The SES2 scheme will result in significant loss and/or fragmentation effects to 14 LWS and 11 BAS, compared to 15 and 8 respectively reported in the main ES, as amended by SES1. However, the mitigation and compensation measures proposed will ensure that no permanent significant residual effects on ecological networks at the regional or route-wide levels are likely to occur.

Habitats

- 3.2.7 Details of the Phase 1 habitat surveys undertaken since the production of the main ES and SES1 are provided in BID document BID-EC-019-000 and Map Series EC-02 which accompanies the SES2 and AP2 ES.

⁴ The main ES reported a total of 159 BAS within the county of Staffordshire. Further information from Staffordshire Ecological Record suggests this should have read a total of 478 BAS and has therefore been amended within the table accordingly.

⁵ Including Halton, Warrington and Wirral.

- 3.2.8 The following new or different likely significant effects to habitats compared to those reported in the main ES, as amended by SES₁, have been identified.
- 3.2.9 Two occurrences of revised valuations of habitats have been reported since the main ES, as amended by SES₁. These are of woodland habitat at Cash's Pit (CA₃), following National Vegetation Classification surveys undertaken by the Staffordshire Wildlife Trust and of an area of grassland to the west of Chorlton Lane (CA₅), following additional Phase 1 habitat surveys carried out by HS₂ Ltd.
- 3.2.10 Both areas were evaluated as being of local/parish value in the main ES and it is now considered that both merit a district/borough level valuation. Cash's Pit is likely to qualify as lowland mixed deciduous woodland and Chorlton Lane is likely to qualify as lowland meadow, which are both habitats of principal importance.
- 3.2.11 Both areas were the subject of mitigation and compensation in the main ES, through woodland and grassland habitat creation close to the area of impact. Given that the habitat creation will target the condition required for qualification as habitats of principal importance, no additional significant effect to habitats is anticipated locally, or at the route-wide level.
- 3.2.12 No other SES₂ changes are likely to result in new or different significant effects to habitats.

Species

- 3.2.13 No further baseline data relating to species has been reported as part of the SES₂ and AP₂ ES.
- 3.2.14 The following new or different likely significant effects to species have been identified as a result of the SES₂ design changes.
- 3.2.15 A metapopulation of great crested newt has been identified as being subject to a different significant effect as a result of an SES₂ design change (Three new working areas and a new utility compound for the British Pipeline Agency diversion works at the Trent North embankment and Brancote South cutting, (SES₂-002-005)). In the absence of mitigation (including provision of replacement ponds), this is considered to represent a different likely significant effect on great crested newt at the route-wide level. This design change has resulted in a temporary reduction in the area of habitat available for great crested newt during construction works associated with a utility diversion. Once the habitat is re-established in this area, there will be no new or different significant effects on great crested newt arising from the SES₂ design change and no residual change to route-wide effects on great crested newt populations is anticipated.
- 3.2.16 A population of water vole was identified in Swill Brook in CA₅, adjacent to the location of the Half Moon inverted siphon. In the main ES, it was assumed that fragmentation effects to the population would be mitigated by the provision of a dry tunnel or mammal ledge at this location. It is no longer considered feasible to provide a tunnel/ledge in the area of the siphon, which would result in a new likely significant effect to the population and the potential to alter the route-wide effects on this species. As a result, the SES₂ scheme has been amended to include the provision of additional alternative mitigation (Amendment to the environmental mitigation

around Half Moon inverted siphon, (SES-005-002)), in the form of habitat creation measures on both sides of the route, to reduce the adverse effect on water vole populations to a level that is not significant. No change to route-wide effects on water vole is therefore anticipated.

- 3.2.17 No other SES2 changes are likely to result in new or different significant effects to species.

Cumulative effects

- 3.2.18 This section of the report considers the SES2 scheme in combination with all AP1 amendments. Section 10 of this report considers these impacts in combination with AP2 amendments.
- 3.2.19 The AP1 amendments would result in a significant effect on one LWS. Therefore cumulatively, the SES2 scheme and AP1 amendments will result in significant effects at 15 LWS, compared to 14 as a result of the SES2 scheme alone. The number of BAS significantly affected remains 11. The assessment of cumulative route-wide effects on designated nature conservation sites and ecological networks remains unchanged.
- 3.2.20 The SES2 scheme will result in the loss of 10.2ha of ancient woodland with a total of 10 sites affected, which is cumulatively significant at national and route-wide levels. The AP1 amendments in combination do not result in any further significant effects on ancient woodland at the route-wide level, as there are no impacts reported at AP1.
- 3.2.21 Table 4 provides a comparison between the most notable habitat losses resulting from the SES2 scheme and the AP1 amendments.
- 3.2.22 In combination with AP1, the total loss of broadleaved woodland resulting from the SES2 scheme would increase by approximately 5.4ha. This loss still represents less than 0.01% of the resource in England⁶ therefore does not represent new or different significant effects at the route-wide level.
- 3.2.23 In combination with AP1, the total loss of neutral grassland resulting from the SES2 scheme would reduce by approximately 5.6ha. This loss represents less than 0.02% of the resource in England⁶ which is not considered to represent new or different significant effects at the route-wide level.
- 3.2.24 In combination with AP1, the total loss of hedgerow resulting from the SES2 scheme would reduce by approximately 2km. This loss remains approximately 0.04% of the resource in England⁶ which is not considered to represent new or different significant effects at the route-wide level.

⁶ Natural England (2008), State of the Natural Environment (NE85). London, Her Majesty's Stationery Office

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Table 4: Cumulative loss of habitat - SES2 scheme in combination with AP1 amendments

Scheme iteration	Approximate extent of semi-natural broadleaved woodland loss (ha)	Approximate extent of unimproved and semi-improved neutral grassland loss (ha)	Approximate extent of hedgerow loss (km)	Approximate extent of loss of ponds (number of)
SES2 scheme	48.8 ⁷	102	189 ^{8,9}	277
Cumulative: SES2 scheme and AP1 amendments	54.2	96.4	187	281

3.2.25 No other new or different likely significant route-wide effects, including on protected species, are expected as a consequence of the SES2 scheme in combination with AP1 amendments.

⁷ Corrected in SES1 and AP1 ES Volume 3: Route-wide effects (Table 1) from 46ha to 48.8ha.

⁸ Corrected in SES1 and AP1 ES Volume 3: Route-wide effects (Table 1) from 180km to 189km.

⁹ This total, however, includes some hedgerows that are likely to be retained, such as those located within land required for overhead line diversions/realignments and those located within land required for the creation of woodland and grassland habitat.

4 Major accidents and natural disasters

4.1 Introduction

- 4.1.1 Volume 3 of the main ES reported the route-wide impacts and likely significant effects arising directly from the construction and operation of the original scheme if it were to be affected by a major accident and/or natural disaster.
- 4.1.2 Volume 3 of SES1 reported that any variations as a result of the SES1 changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 4.1.3 This section of the report identifies any new or different likely significant effects to those reported in Volume 3 of the main ES, due to the SES2 changes.

4.2 Changes to the assessment

- 4.2.1 A review of the foreseeable risks associated with the SES2 changes, recorded in a risk register as required under the Construction (Design and Management) (CDM) 2015 Regulations¹⁰, has been undertaken. This review has concluded that the SES2 changes are not considered to result in any new or different likely significant effects from those reported in Volume 3 of the main ES, as amended by SES1. In addition, no new or different likely significant traffic and transport or flood risk effects or changes to the climate change resilience assessment have been identified as a result of the SES2 changes. Therefore, there are no new or different risks or likely significant effects from those presented in Volume 3 of the main ES as amended by SES1.
- 4.2.2 The nature of the SES2 changes is such that there will be no new or different likely significant effects during operation.

¹⁰ *The Construction (Design and Management) Regulations, (2015)*, London, Her Majesty's Stationery Office, http://www.legislation.gov.uk/uksi/2015/51/pdfs/ukxi_20150051_en.pdf

5 Waste and material resources

5.1 Introduction

- 5.1.1 Volume 3 of the main ES reported an assessment of the route-wide impacts and likely significant effects associated with the off-site disposal to landfill of solid waste that will be generated by the construction and operation of the original scheme.
- 5.1.2 Volume 3 of SES1 reported that any variations as a result of the SES1 changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 5.1.3 This section of the report identifies any new or different likely significant effects to those reported in Volume 3 of the main ES due to the SES2 changes.

5.2 Changes to the assessment

- 5.2.1 A qualitative assessment has been undertaken for the SES2 changes to identify if they would generate new or different quantities of solid waste compared to those reported in the main ES and to identify any material increase in the amount of waste requiring off-site disposal to landfill.
- 5.2.2 The SES2 changes which, collectively, are considered relevant to the assessment of the likely significant environmental route-wide effects associated with waste and material resources during construction are as follows:
- lowering of the Kings Bromley viaduct, Bourne embankment and River Trent viaduct in the Fradley to Colton community area;
 - changes to environmental mitigation, including the provision of a noise bund in the Fradley to Colton community area and landscape earthworks in the vicinity of the Stone Infrastructure Maintenance Base – Rail in the Stone and Swynnerton community area;
 - change to the assumed excavation depth of the borrow pit in the Whitmore Heath to Madeley community area;
 - route-wide refinements and corrections to the analysis of materials quantities and movements that had been used for the main ES as noted in Volume 1 of this SES2 and AP2 ES and described below; and
 - use of local placement areas to manage surplus excavated material¹¹.
- 5.2.3 HS2 Ltd has continued with design development and refinement of the construction assumptions for Phase 2a. As part of the preparation of SES2 and AP2 ES, a route-wide review of the earthworks and materials movement quantities has taken place. Route-wide corrections to the estimated quantities used in the main ES were

¹¹ Land already required for construction of the scheme to be used for the permanent placement of surplus excavated materials, which will subsequently be restored for agricultural use.

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necessary and account for approximately 900,000 m³ (1,838,000 tonnes) of the additional surplus excavated materials.

- 5.2.4 These SES2 changes and the resulting waste arisings are assessed in Section 12: Waste and material resources as part of changes to the AP2 revised scheme. This is because data relating to surplus excavated material quantities cannot be disaggregated between SES2 changes and AP2 amendments.
- 5.2.5 None of the SES2 changes result in a change to the operational waste as reported in the main ES as the SES2 changes relate to construction design and are not relevant to the operational phase of the scheme.

6 Water resources and flood risk

6.1 Introduction

6.1.1 Volume 3 of the main ES provided an assessment of the route-wide impacts and likely significant effects related to surface water and groundwater resources (quality and quantity) and flood risk. It included consideration of the following issues:

- the risk to water resources associated with accidents or spillages from trains during operation of the original scheme;
- a summary of how the original scheme complies with the statutory requirements of the Water Framework Directive (WFD¹²); and
- route-wide flood risk related to alignment of the original scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF¹³).

6.1.2 This section of the report identifies any new or different likely significant effects on surface water and groundwater resources (quality and quantity) and flood risk compared to those reported in Volume 3 of the main ES as amended by SES₁, due to the SES₂ changes.

6.2 Changes to the assessment

Route-wide WFD compliance

6.2.1 Since submission of the Bill, additional information relating to the likely ground conditions in the vicinity of all of the borrow pits in the Fradley to Colton area has become available. For three of these borrow pits, this indicated that useful aggregates may be present to a maximum depth greater than originally estimated. The new information for the fourth borrow pit (at Blithbury, located to the north of the River Trent viaduct) confirmed that the previous assessment of the maximum depth of aggregates was as originally estimated.

6.2.2 Since submission of the Bill, more detailed hydrogeological models have been developed of the areas around each borrow pit. These models have been used to inform the scope of a ground investigation. They provide an improved, but precautionary estimate of the areas where groundwater levels could potentially be affected by the scheme. They assume that the borrow pits are excavated, one at a time, to their maximum depth over their full areas and are fully dewatered. For the following borrow pits a maximum depth of 18m has been assumed:

- Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch;

¹² HM Government (2017). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. London, Her Majesty's Stationery Office.

¹³ Department for Communities and Local Government (2012), *National Planning Policy Framework*. London, Her Majesty's Stationery Office. The assessment work undertaken after July 2018 has taken account of the amendments within the Revised NPPF.

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- Kings Bromley North, located adjacent to the realigned A515 Lichfield Road; and
- Kings Bromley North, located adjacent to the realigned Shaw Lane.

6.2.3 For the borrow pit at Blithbury, located to the north of the River Trent viaduct, a maximum depth of 15m is assumed.

6.2.4 Initial results from preliminary ground investigations indicate that suitable aggregate may not be present to these maximum depths. This further reinforces the conservative and precautionary nature of the assessment of temporary dewatering impacts and effects.

6.2.5 The general approach to excavation and the restoration proposals are set out in the Borrow pits restoration strategy¹⁴. Ground permeability in the areas around the borrow pits is based on British Geological Survey (BGS) geological mapping data¹⁵. Conservatively high permeability values have been selected with the aim of ensuring that the maximum potential extent of the impacts is identified. This new information has necessitated a review of the potential for adverse impacts on local water bodies that have implications for WFD compliance. Those watercourses that are located within the potential zone of groundwater influence of the borrow pits, for which effects were not reported in the main ES, are summarised in Table 5. These effects relate to the three borrow pits at Kings Bromley South and Kings Bromley North, located in the Fradley to Colton area. The location of these watercourses is shown in the water resources and flood risk Map Book of the main ES. Further details of the predicted maximum zone of groundwater influence from these borrow pits are provided in Volume 5: Appendix WR-002-001 and further details of the WFD compliance assessment for SES2 are provided in SES2 and AP2 ES Volume 5 Appendix: WR-001-000.

Table 5: WFD surface water bodies / watercourses scoped into the WFD assessment potentially affected by dewatering of the borrow pits (not previously reported in the main ES)

WFD water body (ID)	Watercourse	Borrow pit potentially affecting watercourse (WFD Assessment reference ID)
Pyford Brook Catchment (GB104028047250)	Pyford Brook	Kings Bromley South, located either side of Crawley Lane on the east and to the south of Ashby Sitch (WFD-BP01)
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Bourne Brook	Kings Bromley South, located either side of Crawley Lane and to the south of Ashby Sitch (WFD-BP01)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Trent and Mersey Canal	Kings Bromley South, located either side of Crawley Lane on the east and to the south of Ashby Sitch (WFD-BP01)
		Kings Bromley North, located adjacent to the realigned

¹⁴ HS2 Ltd (2017). *High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement, Volume 5, Borrow pits restoration strategy*. <https://www.gov.uk/government/publications/hs2-phase-2a-environmental-statement-volume-5-borrow-pits-restoration-strategy>

¹⁵ British Geological Survey (2000). *The physical properties of minor aquifers in England and Wales: Hydrogeology Group Technical Report WD/00/04*, Environment Agency R&D Publication 68.

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		A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed tributary of River Trent (MB to RT) 1	Kings Bromley North, located adjacent to the realigned A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)
	Unnamed tributary of River Trent (MB to RT) 2	Kings Bromley North, located adjacent to the realigned A515 Lichfield Road (WFD-BP02)
		Kings Bromley North, located adjacent to the realigned Shaw Lane (WFD-BP03)

- 6.2.6 The assessment has identified new potential adverse (amber) effects on watercourses within the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent and Mersey Canal, summit to Alrewas (GB70410142), and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies as a result of the new SES2 information. These effects are anticipated to cause a potential risk of deterioration in the current status of these water bodies, requiring the implementation of additional mitigation measures beyond those embedded within the current design and construction methodology of the SES2 scheme, including the measures outlined in the draft CoCP.
- 6.2.7 However, the application of additional mitigation measures is anticipated to reduce the impacts of the borrow pits resulting in minor, localised (yellow) residual effects with no risk of deterioration of the current status of the relevant water bodies. These additional mitigation measures may include use of groundwater cut-offs, excavating the material from (and backfilling) the borrow pits in phases to reduce the groundwater zone of influence, and/or augmenting flow in the watercourses using water abstracted from the borrow pit excavations. These measures will be developed in detail with the Environment Agency following completion of ground investigations and detailed hydrogeological modelling. The approach to excavation, proposed depths of extraction at each borrow pit and restoration proposals are set out in the borrow pits restoration strategy¹⁶.
- 6.2.8 The implementation of these additional mitigation measures will ensure that there will be no residual risks of deterioration to the current status of the relevant surface water bodies as a result of the potential impacts of dewatering the borrow pits on nearby watercourses.
- 6.2.9 The assessment has screened the new information against the available 'reasons for not achieving good' status (RNAG)¹⁷ and 'programme of measures' (PoM)¹⁸ data for the Pyford Brook Catchment (GB104028047250), Bourne-Bilson Brook Catchment

¹⁶ HS2 Ltd (2017). *High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement Volume 5*, Borrow pits restoration strategy, Volume 5: Appendix CT-009-000, <https://www.gov.uk/government/publications/hs2-phase-2a-environmental-statement-volume-5-borrow-pits-restoration-strategy>

¹⁷ Environment Agency dataset which identifies the reasons why various quality elements are failing their status objectives.

¹⁸ Environment Agency dataset which identifies the actions proposed for relevant business sectors to address confirmed RNAG status.

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(trib of Trent) (GB104028047270) and Trent from Moreton Brook to River Tame (GB104028047290) surface water bodies. The new information does not result in any new risks of the route preventing the future achievement of the status objectives for the relevant water bodies. The SES2 scheme is therefore considered to remain compliant with the no prevention of future status objective of the WFD.

- 6.2.10 The SES2 changes will therefore not affect the overall compliance of the SES2 scheme with the objectives of the WFD.

7 Phase One, Phase 2a and Phase 2b combined impacts

7.1 Introduction

- 7.1.1 Volume 3 of the main ES presented a tabulated summary of the potential total impacts of Phase One, Phase 2a original scheme and Phase 2b on a range of environmental receptors. The Phase One data was taken from that reported in the Phase One SES₄ and AP₅ ES¹⁹. Impacts of the Phase 2a original scheme were based on design data and assessments contained within the Phase 2a main ES published in July 2017²⁰. The quantification of the impacts of Phase 2b was derived from the Phase 2b Sustainability Statement²¹.
- 7.1.2 Volume 3 of the Phase 2a SES₁ reported that the SES₁ changes would result in very minor or negligible changes to the combined impact figures presented in Volume 3 of the Phase 2a main ES.
- 7.1.3 This section of the report identifies any changes to the combined impact figures compared to those reported in Volume 3 of the Phase 2a main ES as amended by SES₁, due to the SES₂ changes.

7.2 Summary of changes to combined impacts

- 7.2.1 The SES₂ changes will result in very minor or negligible changes to the figures given in Volume 3 of the main ES, as amended by SES₁.
- 7.2.2 Section 14, Table 21 of this report provides a tabulated summary of the potential total impacts (individually and combined) for Phase One, the Phase 2a AP₂ revised scheme and Phase 2b.
- 7.2.3 Since publication of the Phase 2a main ES as amended by SES₁, the working draft ES for Phase 2b has been published²². Data from this document has been incorporated within the summary of combined impacts given in Table 21.

¹⁹ HS2 Ltd (2015). *High Speed Rail (London - West Midlands). Supplementary Environmental Statement 4 and Additional Provision 5 Environmental Statement. Volume 3. Route-wide effects. December 2015.*

²⁰ HS2 Ltd (2017). *High Speed Rail (West Midlands - Crewe) Environmental Statement*, <https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement>

²¹ Temple-RSK (2016). *High Speed Rail: Phase 2b Preferred Route. Sustainability Statement including Post Consultation Update. Volume 1: Main Report of the Appraisal of Sustainability. A report by Temple-RSK for HS2 Ltd. November 2016.*

²² HS2 Ltd (2018). *HS2 Phase 2b working draft Environmental Statement volume 3: route-wide effects*, <https://www.gov.uk/government/publications/hs2-phase-2b-working-draft-environmental-statement-volume-3-route-wide-effects>

Part 2: Additional Provision 2 Environmental Statement

8 Agriculture, forestry and soils

8.1 Introduction

- 8.1.1 Volume 3 of the main ES reported the route-wide impacts and likely significant effects on agriculture, forestry and soils arising from the construction and operation of the original scheme. It reported temporary and permanent significant route-wide effects on best and most versatile (BMV) land.
- 8.1.2 Volume 3 of SES1 reported that any variations as a result of the SES1 changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 8.1.3 This section of the AP2 ES identifies any new or different likely significant effects on agriculture, forestry and soils compared to those reported in Volume 3 of the main ES, due to the AP2 amendments.

8.2 Changes to the assessment

- 8.2.1 The main ES reported that a total of approximately 2,090ha of agricultural land, including approximately 1,370ha of best and most versatile (BMV) agricultural land, would be required during the construction phase of the original scheme. Construction of the AP2 revised scheme will require approximately 507ha of additional agricultural land during the construction phase, of which 302ha is BMV land. Nearly half of the additional agricultural land required (approximately 230ha) relates to the construction of the Parkgate grid supply point connection. As the design of the connection is refined further, it is expected that the area of agricultural land required temporarily will reduce.
- 8.2.2 Following construction, the land required temporarily will be primarily reinstated to its pre-existing agricultural condition. The remaining area of land that will change permanently from agricultural use as a result of the AP2 revised scheme will increase by 187ha from 1,010ha to 1,197ha, of which approximately 822ha is BMV land in Grade 2 and Subgrade 3a. No additional forestry land will be required as a result of the AP2 revised scheme.
- 8.2.3 The AP2 amendments are not sufficient in scale to result in any new or different likely significant route-wide temporary or permanent effects during construction or operation of the AP2 revised scheme from the temporary and permanent major/moderate adverse effects on BMV land reported in the main ES.

Cumulative effects

- 8.2.4 The potential for any new or different likely significant effects resulting from loss of agricultural land, due to the AP2 amendments in combination with AP1 amendments has been considered. As the additional areas required in AP1 are very small there is considered to be no cumulative route-wide effect.

9 Climate change

9.1 Introduction

- 9.1.1 Volume 3 of the main ES reported the assessment of the GHG emissions of the original scheme during construction and operation. It also reported the assessment of in-combination climate change impacts and climate change resilience during construction and operation.
- 9.1.2 Volume 3 of the SES₁ reported that the SES₁ changes were not considered to result in a material difference to the GHG assessment and that there would be no change to the outcome of the in-combination climate change impacts assessment or the climate change resilience assessment presented in Volume 3 of the main ES.
- 9.1.3 Section 2 of this volume reports that the SES₂ changes are not considered to result in a material difference to the GHG assessment presented in Volume 3 of the main ES as amended by SES₁. It also reports that SES₂ changes do not change the outcome of either the in-combination climate change impacts assessment or the climate change resilience assessment.
- 9.1.4 This section of the AP₂ ES identifies any material changes to the assessment reported in Volume 3 of the main ES due to the AP₂ amendments.

9.2 Changes to the assessment

- 9.2.1 The assessment determined that there would be no change to the outcome of the in-combination climate change impacts assessment or the climate change resilience assessment as a result of the AP₂ amendments. The amendments are, however, considered to have the potential to, cumulatively, result in a material difference to the GHG assessment presented in the main ES. This section reports the impact of the AP₂ amendments on the route-wide GHG assessment.

Carbon footprint scope and methodology

- 9.2.2 The methodology used to assess GHG emissions as a result of the AP₂ amendments remains unchanged from the main ES. No changes have been made to the underlying assumptions of the carbon footprint methodology, for example, carbon factors adopted, the density and weight of construction material, or transport vehicles assumed for logistics.
- 9.2.3 The AP₂ amendments are expected to impact the construction carbon footprint reported in the main ES only. It is assumed that the AP₂ amendments will not impact the operational carbon footprint reported in the main ES. Accordingly, operational-stage carbon emissions have not been re-assessed and this assessment reports no change to the operational carbon footprint reported in the main ES.
- 9.2.4 The quantitative assessment of AP₂ amendments has been produced from data derived from AP₂ amendments combined with data from AP₁ amendments and SES₁ and SES₂ changes. The AP₁ amendments and SES₁ and SES₂ changes were not considered to result in a material difference to the original scheme's carbon footprint and were therefore not subject to further individual assessment. It is therefore

expected that a significant majority of the difference between the carbon footprint reported in the main ES and the revised carbon footprint reported here is associated with the AP2 amendments.

GHG implications of the AP2 amendments

- 9.2.5 Table 6 presents the carbon footprint of the original scheme reported in the main ES and the change in carbon emissions from construction and over 60-year and 120-year operational periods as a result of the SES1 and SES2 changes and AP1 and AP2 amendments.
- 9.2.6 In the main ES, the original scheme's carbon footprint was reported to be approximately 1,378,000 tCO₂e over a 120-year operational period. The GHG assessment of the SES1 and SES2 changes and AP1 and AP2 amendments has reported an increase in the original scheme's carbon footprint of 81,000 tCO₂e, to approximately 1,459,000 tCO₂e over a 120-year operational period. This is due to changes to quantities of material required for construction, transport of construction materials to site and on-site construction and installation activities.
- 9.2.7 Further detail of the quantitative assessment results is included in SES2 and AP2 ES Volume 5: Appendix CL-003-000.

Table 6: The original scheme's carbon footprint from construction and over 60-year and 120-year operational periods as reported in the main ES and as a result of the SES1 and SES2 changes and AP1 and AP2 amendments

Work stage	Life cycle stage	Main ES carbon footprint (tCO ₂ e)		Revised carbon footprint (tCO ₂ e)	
		60 years	120 years	60 years	120 years
Construction	Before use stage	1,370,000		1,451,000	
Operation	Use stage	141,000	315,000	141,000	315,000
	Benefits and loads beyond project boundaries	-159,000	-307,000	-159,000	-307,000
Total residual carbon emissions		1,352,000	1,378,000	1,433,000	1,459,000

Conclusions

- 9.2.8 The SES1 and SES2 changes and AP1 and AP2 amendments result in an increase to the carbon footprint reported in the main ES of approximately 6%.
- 9.2.9 The main contributions to the construction carbon footprint remains the same as reported in the main ES (i.e. track, viaducts, bridges and tunnels).
- 9.2.10 The SES1 and SES2 changes and AP1 and AP2 amendments are assumed to not impact the operational carbon footprint. As such, the operational carbon footprint is as reported in the main ES.
- 9.2.11 The revised annualised construction carbon emissions compared against the Green Construction Board's 2026 projected UK construction sector as a whole account for less than 1% of the projected 2026 total UK construction carbon emissions. Operational carbon emissions are projected to be less than 0.01% of UK total transport emissions in 2027 (opening year).

Combined carbon footprint of Phase One and Phase 2a (as amended)

9.2.12 The combined carbon footprint of the construction and operation of Phase One²³ and Phase 2a (as amended by SES1 and SES2 changes and AP1 and AP2 amendments) is reported in Table 7.

Table 7: Combined carbon footprint of Phase One and Phase 2a (as amended) associated with construction and 120 years of operation

Work stage	Life cycle stage	Phase One carbon footprint (tCO ₂ e)	Phase 2a (as amended) carbon footprint (tCO ₂ e)	Combined carbon footprint of Phase One and Phase 2a (as amended) (tCO ₂ e)
Construction	Before use stage	6,125,000	1,451,000	7,576,000
Operation	Use stage	2,300,000 ²⁴	315,000	2,615,000
	Benefits and loads beyond project boundaries	-5,270,000 ²⁵	-307,000	-5,577,000
Total residual carbon emissions		3,155,000 ²⁶	1,459,000	4,614,000

²³ HS2 Ltd (2015). *High Speed Two (HS2) (London - West Midlands), Supplementary Environmental Statement 3 and Additional Provision 4 Environmental Statement, Volume 3: Route-wide effects*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/466703/SES3 AP4 ES Volume 3 Route-wide effects.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/466703/SES3_AP4_ES_Volume_3_Route-wide_effects.pdf)

²⁴ Note this is the use stage carbon emissions over the first 60 years of Phase One operation (i.e. 2026-2085). It does not account for years 61-120 (i.e. 2086-2145). It is possible that this figure underestimates the 120-year impact, however the disparity in temporal scope is not expected to result in a significant underestimate given the rate and extent of forecast decarbonisation of UK grid electricity.

²⁵ Note this is the benefits and loads beyond the project boundary over the first 60 years of Phase One operation (i.e. 2026-2085). It does not account for years 61-120 (i.e. 2086-2145). It is possible that this figure underestimates the 120-year impact, however the disparity in temporal scope is not expected to result in a significant underestimate given the rate and extent of forecast electric vehicle uptake and decarbonisation of road and air journeys.

²⁶ Note this is the residual carbon emissions associated with the construction of Phase One and the first 60 years of its operation (i.e. 2026-2085). It does not account for years 61-120 (i.e. 2086-2145).

10 Ecology and biodiversity

10.1 Introduction

- 10.1.1 Volume 3 of the main ES reported the impacts and likely significant effects on ecological resources that will occur at a route-wide level as a consequence of the construction and operation of the original scheme. The route-wide assessment addressed significant effects at the regional and national level, and in-combination effects not discussed within Volume 2 of the main ES.
- 10.1.2 Volume 3 of the SES₁ reported that any variations as a result of the SES₁ changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 10.1.3 Section 3 of this volume report identifies any new or different likely significant effects due to the SES₂ changes.
- 10.1.4 This section of the AP₂ ES identifies any new or different likely significant effects on ecological resources compared to those reported in Volume 3 of the main ES as amended by SES₁ and SES₂, due to the AP₂ amendments.

10.2 Changes to the assessment

Designated sites

Statutory sites

- 10.2.1 Five statutory designated nature conservation sites have been identified as relevant to the AP₂ amendments These are:
- Special Area of Conservation (SAC): Pasturefields Salt Marsh SAC (CA₂);
 - Sites of Special Scientific Interest (SSSIs): Blithfield Reservoir and Braken Hurst (CA₁) and Pasturefields Salt Marsh (CA₂); and
 - Local Nature Reserves (LNRs): Stone Meadows and Ferndown (both CA₃).
- 10.2.2 An updated Habitats Regulations Assessment (HRA) screening document (Volume 5: Appendix EC-017-004) concludes that the AP₂ amendment (Additional land permanently required for the reconfiguration of Ingestre Park Golf Club, (AP₂-002-010)) will not give rise to new or different significant effects on the integrity of Pasturefields Salt Marsh SAC. There is no change to significant effects on sites of international importance for nature conservation at the route-wide level.
- 10.2.3 In the absence of mitigation, the AP₂ amendments would result in a new significant adverse effect on bird species for which Pasturefields Salt Marsh SSSI and the Blithfield Reservoir SSSI are designated. However, the implementation of avoidance and mitigation measures for birds, and habitat creation and reinstatement will reduce the effects to a level that is not significant.
- 10.2.4 The AP₂ amendments will result in new permanent adverse effects on Stone Meadows LNR and Ferndown LNR through the loss of small areas (<1ha habitats that are a qualifying interest feature for those sites). Suitable off-site compensatory

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measures are being sought, in order to reduce adverse effects on Ferndown LNR and Stone Meadows LNR, in consultation with relevant stakeholders. These measures, once implemented, would reduce the adverse effects to a level that is no longer significant.

- 10.2.5 Given the above, the AP2 amendments will not result in new or different significant effects on the network of statutory designated nature conservation sites at the route-wide level.

Non-statutory sites

- 10.2.6 The AP2 amendments will result in new or different likely significant effects on a total of 13 non-statutory sites, prior to mitigation (Table 8 and Table 9). Further information on these sites is provided in the following sections and in SES2 and AP2 ES Volume 5: Appendix EC-001-000 and Map Series EC-01.

Local Wildlife Sites

Table 8: LWS impacted by AP2 revised scheme

Site Name	CA	Amendment	Impact type	Effect type (new or different)
Tuppenhurst Lane (West of)	1	Alterations to the Handsacre Junction connection to the WCML (AP2-001-001)	Direct, partially within AP2 revised scheme	New – County level.
Kings Bromley Wharf to Fradley Junction, Coventry Canal	1	New pipework from the Kings Bromley South borrow pit for groundwater recharge to Pyford Brook, Ashby Sitch and Bourne Brook (AP2-001-003)	Direct, partially within AP2 revised scheme	Different – however no change in level of significance reported at main ES as amended by SES1 and SES2
Newlands Lane (Hedge 6)	1	Grid supply point connection to National Grid Parkgate substation (AP2-001-015)	Direct, partially within AP2 revised scheme	Different – County level (different county level effect as reported at main ES as amended by SES1 and SES2)
Newlands Lane (Hedge 7)	1	Grid supply point connection to National Grid Parkgate substation (AP2-001-015)	Direct, partially within AP2 revised scheme	New – County level
Whitmore Wood	4	Changes to the vertical and horizontal alignment between Hatton South cutting and Madeley Bridleway 1 accommodation green overbridge (AP2-004-002)	Direct, partially within AP2 revised scheme	Different – County level (different county level effect as reported at main ES as amended by SES1 and SES2)
Hey Sprink (wood south-west of)	4	Changes to the vertical and horizontal alignment between Hatton South cutting and Madeley Bridleway 1 accommodation green overbridge (AP2-004-	Direct, partially within AP2 revised scheme	Different – County level (different county level effect as reported at main ES as amended by SES1 and SES2)

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Site Name	CA	Amendment	Impact type	Effect type (new or different)
		002)		
The Bogs	4	Modifications to the A51 Stone Road / Nantwich Road / A53 Newcastle Road Junction (AP2-004-003)	Direct, partially within AP2 revised scheme	New – County level
Randilow and Bunker Hill	5	Diversion of a section of a Scottish Power Energy Networks 132kv overhead line at Checkley Lane and a utility compound (AP2-005-003)	Direct, partially within AP2 revised scheme	Different – however no change in level of significance reported at main ES as amended by SES1 and SES2 Different – however no change in level of significance reported at main ES as amended by SES1 and SES2

10.2.7 The AP2 amendments would result in significant loss and/or fragmentation effects to 8 LWS. However, the mitigation and compensation measures proposed will ensure that no permanent significant residual effects on ecological networks at the regional or route-wide levels are likely to occur.

Biodiversity Alert Sites

Table 9: BAS impacted by AP2 revised scheme

Site Name	CA	Amendment	Impact type	Effect type (new or different)
Long Mets Lane (Hedge 1)	1	Grid supply point connection to National Grid Parkgate substation (AP2-001-015)	Direct, partially within AP2 revised scheme	Different – District/borough level
Newlands Lane Track (Hedge 1)	1	Grid supply point connection to National Grid Parkgate substation (AP2-001-015)	Direct, within AP2 revised scheme	New – District/borough level
Ferndown BAS	3	Modifications to the roundabout junction of the A500 Queensway/A519 Newcastle Road/A519 Clayton Road (Hanchurch Interchange) and the signalised crossroads junction of the A519 Newcastle Road/A5182 Trentham Road/B5038 Whitmore Road and a new temporary satellite construction compound (AP2-003-017)	Direct, partially within AP2 revised scheme	New – District/borough level
Hanchurch Roundabout	3	Modifications to the roundabout junction of the A500 Queensway/A519 Newcastle Road/A519 Clayton Road (Hanchurch Interchange) and the signalised crossroads junction of the A519 Newcastle Road/A5182 Trentham Road/B5038 Whitmore Road and a new temporary satellite construction compound (AP2-003-017)	Direct, partially within AP2 revised scheme	New – District/borough level
Closepit Plantation	3	Provision of a roundabout at the junction of the A51 Stone Road/	Direct, partially within AP2	Different – however no change in level of

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Site Name	CA	Amendment	Impact type	Effect type (new or different)
		Tittensor Road diversion (AP2-003-012)	revised scheme	significance reported at main ES as amended by SES1 and SES2

10.2.8 The AP2 amendments would result in significant loss and/or fragmentation effects to 5 BAS. However, the mitigation and compensation measures proposed will ensure that no permanent significant residual effects on ecological networks at the regional or route-wide levels are likely to occur.

10.2.9 Total numbers of non-statutory nature conservation sites affected by the AP2 revised scheme are summarised in Table 10.

Table 10: Designated sites impacted, by county

County	Designation type	No. of sites at SES2	No. of sites at AP2	No. of type in county	% of sites impacted
Staffordshire	LWS	14	17	932	1.8%
	BAS	11	14	478	2.9%
Cheshire	LWS	1	1	1,032 ²⁷	0.1%

10.2.10 The mitigation and compensation measures proposed in the main ES, as amended by SES1, SES2 and AP2 will ensure there will be no additional permanent significant residual effects on the impacted non-statutory sites, or on ecological networks at the regional or route-wide level as a result of the AP2 amendments.

Ancient woodland

10.2.11 On the basis of the heritage review undertaken by HS2 Ltd, there is an additional woodland, Lower Birches Plantation/Titler's Plantation, of relevance to the AP2 revised scheme, which does not appear on the AWI but is considered to be potentially ancient. This woodland is partially within the area subject to the Parkgate grid supply point connection AP2 amendment. This amendment will require the temporary diversion of an existing powerline, which runs over this woodland. The works will involve lowering the height of any trees that would otherwise infringe on minimum clearances between the trees and the powerline. The amendment will result in up to 0.2ha of additional woodland being subject to tree height reductions to comply with the minimum clearance. The Parkgate grid supply point connection will therefore, on a precautionary basis, result in a new permanent adverse effect upon this potential ancient woodland that is significant at up to the county level. The wholesale clearance of vegetation and removal of ancient woodland soils will be avoided.

10.2.12 As a result, the total number of ancient woodlands directly affected by the AP2 revised scheme will increase by one to 11.

²⁷ Including Halton, Warrington and Wirral

- 10.2.13 The change to the alignment in the Whitmore Heath to Madeley AP2 amendment will result in a small reduction in the extent of ancient woodland losses at Whitmore Wood AWI and Hey Sprink (wood south-west of) AWI (by 0.6ha) compared to those reported in the main ES, as amended by SES1 and SES2.
- 10.2.14 Overall, there is a small reduction in losses resulting from the AP2 amendments. Given that ancient woodland is irreplaceable, the overall residual effect to ancient woodland will remain significant at the national and route-wide level.

Habitats

- 10.2.15 The AP2 amendments will result in the following changes to the extent of the most notable habitat losses that are described in the main ES, as amended by SES1 and SES2:
- semi-natural broadleaved woodland – loss of 6.5ha of semi-natural broadleaved woodland arising from the AP2 amendments, in addition to the 48.8ha reported to be lost as a result of the SES2 scheme. The AP2 revised scheme will therefore result in the loss of 55.3ha of semi-natural broadleaved woodland²⁸. This remains approximately 0.01 % of the natural resource in England²⁹ and is not considered to be significant at the route-wide level;
 - semi-improved grassland – loss of 19.4ha of semi-improved grassland arising from the AP2 amendments, in addition to the 102ha reported to be lost as a result of the SES2 scheme. The AP2 revised scheme will therefore result in the loss of 121.4 ha of semi-improved grassland. This remains approximately 0.02% of the natural resource in England²⁹ and is not considered to be significant at the route-wide level;
 - hedgerow – using the same precautionary approach adopted in the main ES and at AP1, the AP2 amendments will result in the loss of approximately 12.3km of hedgerows, in addition to the 189km reported to be lost as a result of the SES2 scheme. The AP2 revised scheme will therefore result in the loss of approximately 201.3km of hedgerows. This remains approximately 0.04 % of the resource in England and is not considered to be significant at the route-wide level; and
 - ponds – loss of 21 ponds arising from the AP2 amendments, in addition to 277 ponds lost as a result of the SES2 scheme. The AP2 revised scheme will therefore result in the loss of 298 ponds. This remains approximately 0.13% of the natural resource in England and is not considered to be significant at the route-wide level.

²⁸ This loss is the total of woodland habitats of principal importance that are lost, namely lowland mixed deciduous woodland and wet woodland. The majority of ancient woodland lost is also of semi-natural broadleaved woodland and these areas are therefore included within this total. Areas of ancient woodland that are Plantation on Ancient Woodland Sites (PAWs) are not included within this total.

²⁹ Natural England (2008), State of the Natural Environment. NE85. London, Her Majesty's Stationery Office.

- 10.2.16 The AP2 amendments will increase the loss of habitats of principal importance listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act³⁰ by approximately 24.5ha, from 107.8ha as a result of the SES2 scheme. Therefore, the AP2 revised scheme will result in the loss of approximately 132.3ha of habitats of principal importance, including approximately 46.2ha of lowland mixed deciduous woodland and 40.1ha of lowland meadow.
- 10.2.17 A number of the AP2 amendments involve or necessitate minor revisions to the ecological mitigation/compensation areas included within the SES2 scheme, including the provision of additional mitigation. Following implementation, the AP2 revised scheme will result in the creation of 516.7ha of habitats of principal importance, compared with 481ha that was reported in the main ES, as amended by SES1 and SES2. Overall, the AP2 revised scheme will therefore result in a further 35.7ha of habitat creation.
- 10.2.18 None of the changes in the extent of habitat losses as a result of the AP2 amendments are likely to generate any new or different significant effects at a route-wide level.

Species

- 10.2.19 It is considered that on a precautionary basis, the AP2 amendment, Parkgate grid supply point connection, would result in increased bird mortality as a result of collisions with overhead power lines and the loss of foraging habitat at the River Blithe. In the absence of mitigation, this would give rise to a new permanent adverse effect on the wintering bird assemblage associated with the River Blithe corridor that is significant at up to the national level. It is considered that would be a new significant effect at the route-wide level.
- 10.2.20 Mitigation measures will however be provided to reduce the potential for bird collision with the new powerline, such measures will include habitat creation and reinstatement, and the installation of bird diverters in accordance with National Grid's Protocol on Bird Diverters. The exact type and location of bird diverters will be determined by the outcome of a species-specific assessment of bird collision risk. The implementation of these mitigation measures will reduce the effect on the wintering bird assemblage associated within the River Blithe corridor to a level that is not significant.
- 10.2.21 The main ES, as amended by SES1 and SES2, reported effects on four bat assemblages of significance at up to regional level. Following a precautionary approach, the AP2 amendments result in new or different effects on 10 bat assemblages of significance at up to regional level (see below). This is considered to represent a new significant effect at the route-wide level:
- CA1 Maintenance access under Pyford Brook viaduct amendment - assemblages at Trent and Mersey Canal and Cranberry Wood - different effect - no change - regional;

³⁰ *Natural Environment and Rural Communities Act (2006)*. London, Her Majesty's Stationery Office.

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- CA1 Lichfield Road and Wood End Lane amendment - assemblages at Trent and Mersey Canal and Cranberry Wood - different effect - no change - regional;
- CA1 Kings Bromley North borrow pit pipework amendment - assemblages at Trent and Mersey Canal and Cranberry Wood - different effect - no change - regional;
- CA1 National Grid Parkgate substation amendment - assemblages at River Blithe and its tributaries - new effect - up to regional;
- CA1 National Grid Parkgate substation amendment - assemblages at Birch and Roosthill Woods - new effect - up to regional;
- CA2 Mayfield Children's Home assemblage at Pipe Wood and land southeast of Blithbury - different effect - no change - regional;
- CA2 Ingestre Park Golf Club - assemblage at Golf Club - different effect - no change - regional;
- CA2 Diversion of National Grid gas pipeline, north-west of Great Haywood Marina - new effect - no change - up to regional;
- CA2 Cadent pipeline east of Ingestre green overbridge - assemblage at golf club - different effect - no change - up to regional; and
- CA3 Water treatment facility at Hanchurch - new effect - up to regional.

10.2.22 In addition, the AP2 amendments result in new or different effects to 14 further bat assemblages of significance at up to the county level.

10.2.23 In the absence of mitigation, the AP2 amendments will result in increased new and different route-wide significant effects on bat assemblages to those reported at main ES as updated by SES1 and SES2.

10.2.24 Mitigation measures will be provided to compensate for the loss of bat foraging, commuting and roosting habitat; such measures will include habitat creation and artificial roosting provision. With the implementation of these mitigation measures, it is likely that adverse effects on bat populations as a consequence of the construction and operation of the AP2 revised scheme (including those on rarer bat species) will be reduced to the local/parish level or below. The mitigation and compensation provided to address population level effects is also appropriate to ensure that there will be no cumulative effects on the species concerned. Therefore, no significant residual effects on the conservation status of bats are likely to occur at the route-wide level.

10.2.25 The main ES as amended by SES1 and SES2 reported effects on 16 great crested newt meta-populations of significance at up to the county level, and a further 178 assumed populations associated with ponds which had not been surveyed and so assumed present as a precautionary approach. The AP2 amendments result in new effects on three great crested newt meta-populations of significance at up to the county level. This is considered to represent a new significant effect at the route-wide level. A further eight meta-populations will be subject to different effects, but this will not

change the level of significance reported in the main ES as amended by SES₁ and SES₂.

- 10.2.26 Mitigation measures will be provided to compensate for the loss of great crested newt foraging, dispersal and shelter habitats; such measures will include terrestrial and aquatic habitat creation. Following the implementation of these mitigation measures, it is likely that adverse impacts on great crested newts and other amphibians during construction of the AP₂ revised scheme will be reduced such that it is considered unlikely that a significant effect will occur. Therefore, no significant residual effects on the conservation status of great crested newt are likely to occur at the route-wide level.

Cumulative effects

- 10.2.27 This section of the report identifies any new or different likely significant effects on ecological resources compared to those reported in Volume 3 of the main ES as amended by SES₁ and SES₂, due to the AP₂ amendments in combination with AP₁ amendments.
- 10.2.28 In combination with the AP₁ amendments, there is one additional LWS that is subject to significant effects (Kings Bromley Pit north-west of Manor Park LWS). There are no additional BAS subject to significant effects as a result of the combined amendments. Overall, this will result in a different significant effect to designated sites, but route-wide effects on ecological networks, following the implementation of mitigation, will remain unchanged.
- 10.2.29 As there are no impacts reported as a result of the AP₁ amendments, the cumulative route-wide effect on ancient woodland will remain significant at the national level.
- 10.2.30 Table 11 provides a comparison between habitat losses resulting from the AP₂ revised scheme alone and those which will occur in combination with AP₁ amendments, on key habitats.
- 10.2.31 In relation to broadleaved woodland, the AP₂ revised scheme will result in the loss of approximately 55.3ha of broadleaved woodland. In combination with all relevant AP₁ amendments, the total loss of broadleaved woodland would increase to approximately 60.7ha. This is an increase of 5.4ha compared to the AP₂ revised scheme alone and is not likely to generate a new or different significant effect at the route-wide level.
- 10.2.32 In relation to neutral grassland, the AP₂ revised scheme will result in the loss of approximately 121.4ha of neutral grassland. In combination with all relevant AP₁ amendments, the total loss of neutral grassland would reduce to approximately 115.8ha. This is a reduction of 5.6ha³¹ compared to the AP₂ revised scheme alone and is not likely to generate a new or different significant effect at the route-wide level.

³¹ The AP₁ ES Volume 3 reported that, following additional surveys and subsequent re-classification of areas of grassland habitat, there was a net reduction by approximately 5.6ha of neutral grassland to be lost as a result of the construction of the AP revised scheme compared with the original scheme.

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- 10.2.33 In relation to hedgerows, the AP2 revised scheme will result in an increased loss of hedgerow within each community area (CA), this represents a route-wide loss of an additional 12.3km of hedgerow. This does not represent a different significant effect at CA level, but does result in a different significant effect at route-wide level. In combination with all relevant AP1 amendments, the total loss of hedgerow would reduce to approximately 199.3km. This is an increased loss of 10.3km compared to the main ES, representing a different significant effect at the route-wide level.
- 10.2.34 In relation to ponds, the AP2 revised scheme will result in the loss of 298 ponds. In combination with all relevant AP1 amendments, the total loss of ponds would increase to 302. This is an increase of four ponds compared to the AP2 revised scheme and is not likely to generate a new or different significant effect at the route-wide level.

Table 11: Cumulative loss of habitats – SES2 scheme in combination with AP1 and AP2 revised schemes

Scheme iteration	Approximate extent of semi natural broadleaved woodland loss (ha) ³²	Approximate extent of unimproved and semi-improved neutral grassland loss (ha)	Approximate extent of hedgerow loss (km)	Approximate extent of loss ponds (number)
AP2 revised scheme	55.3	121.4	201.3	298
Cumulative: AP2 revised scheme plus AP1 amendments	60.7	115.8	199.3	302

- 10.2.35 The AP1 amendments will not result in any new or different likely significant effects on species. No new or different likely significant effects relevant at a route-wide level are expected as a consequence of AP2 amendments occurring in combination with AP1 amendments.

³² This loss is the total of woodland habitats of principal importance that are lost, namely lowland mixed deciduous woodland and wet woodland. The majority of ancient woodland lost is also of semi-natural broadleaved woodland and these areas are therefore included within this total. Areas of ancient woodland that are Plantation on Ancient Woodland Sites (PAWs) are not included within this total.

11 Major accidents and natural disasters

11.1 Introduction

- 11.1.1 Volume 3 of the main ES reported the route-wide impacts and likely significant effects arising directly from the construction and operation of the original scheme if it were to be affected by a major accident and/or natural disaster.
- 11.1.2 Volume 3 of SES1 reported that any variations as a result of the SES1 changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 11.1.3 Section 4 of this volume reports that the SES2 changes would not result in any new or different likely significant route-wide effects.
- 11.1.4 This section of the AP2 ES identifies any new or different likely significant effects compared to those reported in Volume 3 of the main ES due to the AP2 amendments.

11.2 Changes to the assessment

- 11.2.1 A review of the foreseeable risks associated with the AP2 amendments, recorded in a risk register as required under the Construction (Design and Management) (CDM) 2015 Regulations, has been undertaken. This review has concluded that the AP2 amendments are not considered to result in new or different likely significant effects from those reported in Volume 3 of the main ES, as amended by SES1 and SES2. In addition, no new or different likely residual significant traffic and transport or flood risk effects, or changes to the climate change resilience assessment have been identified as a result of the AP2 amendments. Therefore, there are no new or different risks or likely significant effects from those presented in Volume 3 of the main ES as amended by AP1 amendments.
- 11.2.2 The nature of the AP2 amendments is such that there will be no new or different likely significant effects during operation.

12 Waste and material resources

12.1 Introduction

- 12.1.1 Volume 3 of the main ES reported an assessment of the route-wide impacts and likely significant effects associated with the off-site disposal to landfill of solid waste that will be generated by the construction and operation of the original scheme.
- 12.1.2 Volume 3 of the SES₁ reported that any variations as a result of the SES₁ changes were not sufficient in scale to result in any new or different significant route-wide effects compared to those presented in Volume 3 of the main ES.
- 12.1.3 Section 5 of this volume reports that SES₂ changes will, collectively, generate additional waste.
- 12.1.4 This section of the AP₂ ES identifies any new or different likely significant effects associated with the off-site disposal to landfill of solid waste compared to those reported in Volume 3 of the main ES, due to the SES₂ changes and AP₂ amendments.

12.2 Changes to the assessment

Policy framework

National policy framework

- 12.2.1 The national policy framework in relation to waste management is as set out in Volume 3 of the main ES.

Local policy framework

- 12.2.2 The local policy framework in relation to Staffordshire and Stoke-on-Trent is as set out in Volume 3 of the main ES.
- 12.2.3 The local policy framework in relation to East Cheshire is fundamentally the same as set out in Volume 3 of the main ES. The Local Plan Strategy has now been adopted (July 2017) but the Minerals and Waste Development Plan Document remains in preparation³³.

Scope, assumptions and limitations

- 12.2.4 The assessment scope, key assumptions and limitations are as set out in the main ES Environmental Impact Assessment Scope and Methodology Report and its Addendum (see main ES Volume 5: Appendix CT-001-001 and Volume 5: Appendix CT-001-002).

Assessment methodology

- 12.2.5 The assessment methodology is as set out in the main ES Environmental Impact Assessment Scope and Methodology Report and its Addendum (see main ES Volume 5: Appendix CT-001-001 and Volume 5: Appendix CT-001-002).

³³ Cheshire East Council (2018). *Cheshire East Local Plan*, https://www.cheshireeast.gov.uk/planning/spatial_planning/cheshire_east_local_plan/cheshire_east_local_plan.aspx

Environmental baseline

Waste arisings and management

Construction, demolition and excavation waste

- 12.2.6 Latest available information³⁴ reports that a total of 107,557,676 tonnes of CDEW was produced in England in 2014. (The UK Government reports CDEW arisings (to the EU) using the NACE classification³⁵.) Of this amount, 44,886,516 tonnes (approximately 42%) of CDEW was recovered and 25,577,137 tonnes (approximately 26%) was sent to landfill.

Commercial and industrial waste

- 12.2.7 Latest available information reports that, in 2016, a total of 33,100,000 tonnes of commercial and industrial waste was produced in England according to returns made under the EU Waste Statistics Regulation³⁶. Based on the waste management methods identified in the 2011 Defra survey³⁷, it is expected that of this amount:

- 17,212,000 tonnes (52%) was reused, recycled or composted;
- 5,627,000 tonnes (17%) was diverted from landfill via various treatment and recovery methods;
- 7,613,000 tonnes (23%) was disposed to landfill; and
- the fate of 2,648,000 tonnes (8%) was unknown.

Waste infrastructure

Existing baseline

- 12.2.8 Table 12 provides baseline waste infrastructure capacity data for the two regions through which the AP2 revised scheme will pass³⁸.
- 12.2.9 The baseline information presented is based on permitted capacity for all types of waste treatment and disposal facilities for the year 2017, published by the Environment Agency. Waste infrastructure capacity for all types of treatment and disposal facility (including incineration, transfer and treatment) is reported in the baseline to provide context for this assessment.
- 12.2.10 Baseline waste infrastructure capacity data for the relevant counties within each of the regions is provided in the SES2 and AP2 ES, Volume 5: Appendix WM-001-000.

³⁴ Defra (2018). *UK Statistics on Waste – 22 February 2018*,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683051/UK_Statistics_on_Waste_statistical_notice_Feb_2018_FINAL.pdf

³⁵ NACE: Nomenclature générale des activités économiques dans les Communautés Européennes; equivalent in English is General Industrial Classification of Economic Activities within the European Communities. European Competition Commission (undated) *CDEW is defined as NACE Code F (Construction category)*. Available online at: http://ec.europa.eu/competition/mergers/cases/index/nace_all.html

³⁶ Regulation (EC) No. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics.

³⁷ Defra (2011). *Commercial and Industrial Waste Survey 2009 Final Report*. Available online at:

<http://webarchive.nationalarchives.gov.uk/20130125163914/http://www.defra.gov.uk/statistics/files/ci-project-report.pdf>

³⁸ Environment Agency (2018). *Waste Management in England*, <https://www.gov.uk/government/publications/waste-management-data-for-england>

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Table 12: Baseline waste infrastructure capacity by region, 2017

Facility type	West Midlands capacity (tonnes)	North West capacity (tonnes)	Total capacity (tonnes)
Inert waste landfill	21,565,500	8,740,500	30,306,000
Non-hazardous waste landfill	35,256,740	25,964,890	61,221,630
Hazardous waste landfill	802,500	9,838,500	10,641,000
<i>Sub-total landfill</i>	<i>57,624,740</i>	<i>44,543,890</i>	<i>102,168,630</i>
Municipal solid waste, commercial and industrial waste incineration	1,970,000	977,000	2,947,000
Other incineration	498,000	636,000	1,134,000
<i>Sub-total incineration</i>	<i>2,468,000</i>	<i>1,613,000</i>	<i>4,081,000</i>
Waste transfer	4,210,000	6,102,000	10,312,000
Waste treatment	5,997,000	16,467,000	22,464,000
Metal recycling	2,172,000	3,202,000	5,374,000
<i>Sub-total treatment and waste transfer</i>	<i>12,379,000</i>	<i>25,771,000</i>	<i>38,150,000</i>
Total	72,474,740	71,927,890	144,399,630

Future baseline

- 12.2.11 Permitted capacity data published by the Environment Agency has been used to provide an indication of projected landfill capacity for the future baseline. This method provides an indication of projected landfill disposal capacity for each class of landfill as defined by Council Directive 1999/31/EC³⁹ (the Landfill Directive). This relates to the capacity of inert, non-hazardous and hazardous waste landfill that will be available during the period 2020 to 2026 (for construction) and 2027 (for operation) within each of the regional areas through which the AP2 revised scheme will pass. Projected landfill capacity data for the relevant counties within each of the regions is provided in the SES2 and AP2 ES, Volume 5: Appendix WM-001-000.
- 12.2.12 Projected landfill capacity is based on the average percentage change in permitted landfill capacity for the years 2000 to 2017 (for inert and non-hazardous waste landfills) and for the years 2006 to 2017 (for hazardous waste landfill) as reported by the Environment Agency. The average percentage change has then been applied to the reported 2017 permitted landfill capacity and projected forward to 2027.

Inert waste landfill capacity

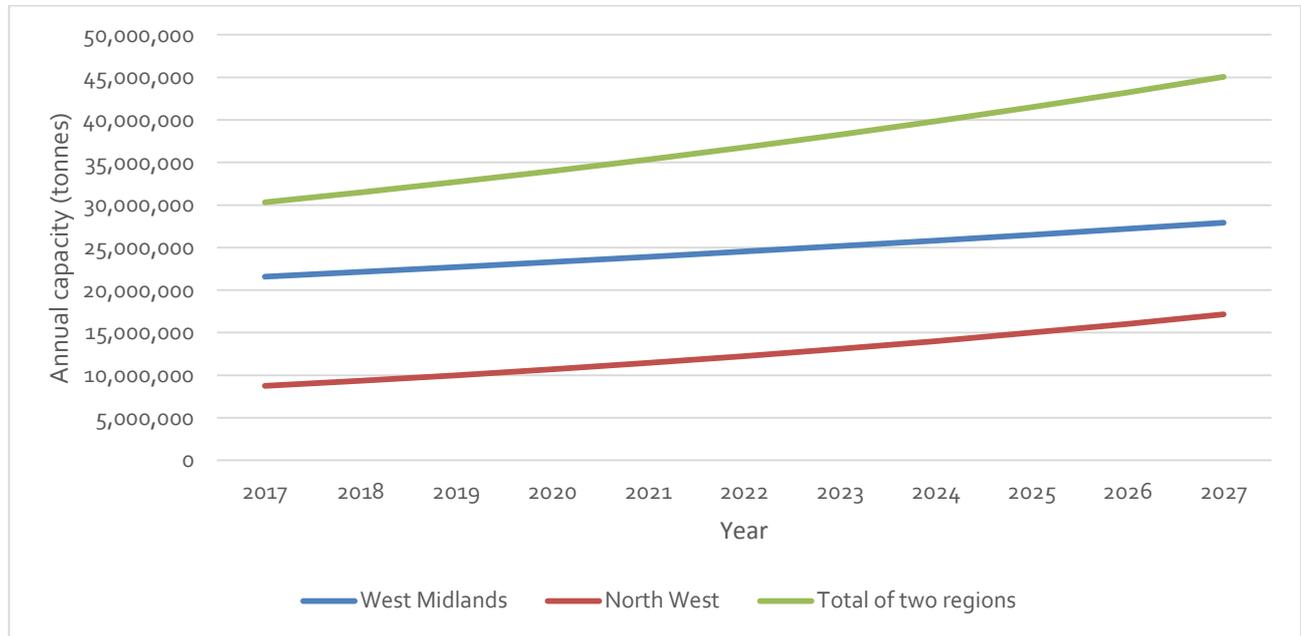
- 12.2.13 Using the latest available published data for the year 2017 as a starting point, Figure 2 shows projected inert waste landfill capacity for the future baseline period 2020 to 2026 (for construction) and the year 2027 (operation). Detailed source data, and local

³⁹ Directive 1999/31/EC of 26 April 1999 on the landfill of waste, European Council.

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level projections, are presented in the SES2 and AP2 ES, Volume 5:
Appendix WM-001-000.

Figure 2: Projected (future baseline) inert waste landfill capacity by region



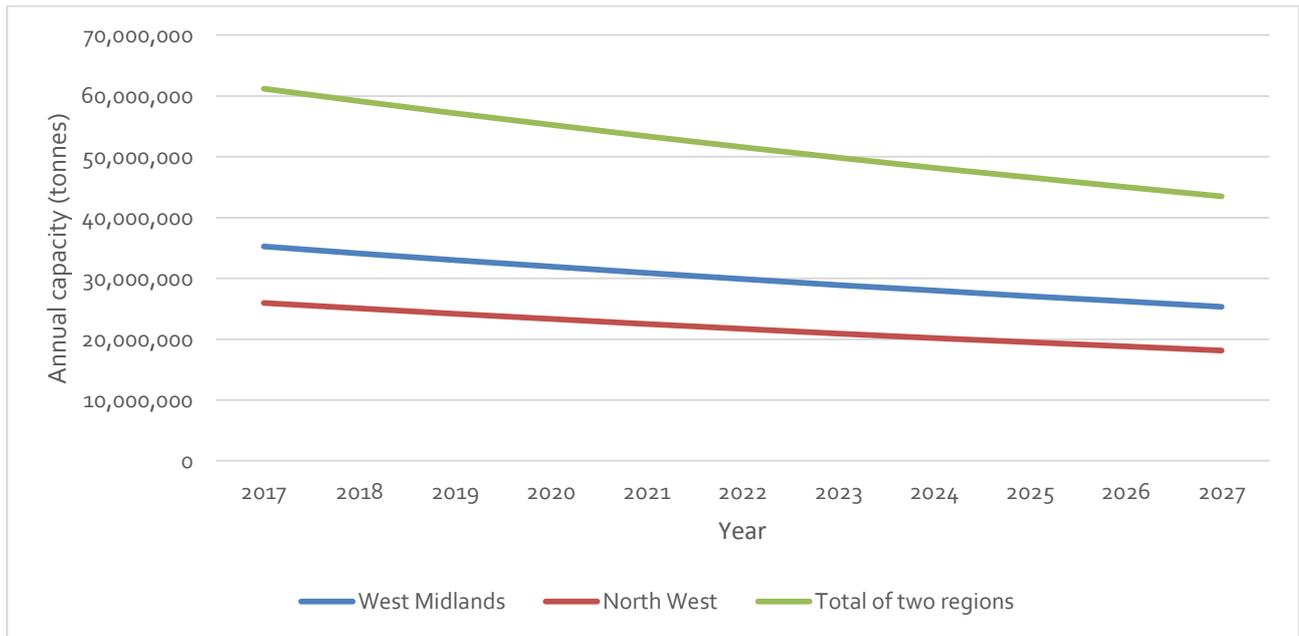
12.2.14 Figure 2 shows that, by 2027, there will be a combined total of approximately 45 million tonnes of inert waste landfill capacity remaining in the two regions through which the AP2 revised scheme will pass. This is a projected increase from approximately 32 million tonnes of inert waste landfill capacity in 2016, which reflects a gradual increase in inert waste landfill capacity in both regions during the period.

Non-hazardous waste landfill capacity

12.2.15 Using latest available published data for the year 2017 as a starting point, Figure 3 shows projected non-hazardous waste landfill capacity for the future baseline period 2020 to 2026 (for construction) and the year 2027 (operation). Detailed source data, and local level projections, are presented in the SES2 and AP2 ES, Volume 5: Appendix WM-001-000.

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Figure 3: Projected (future baseline) non-hazardous waste landfill capacity by region



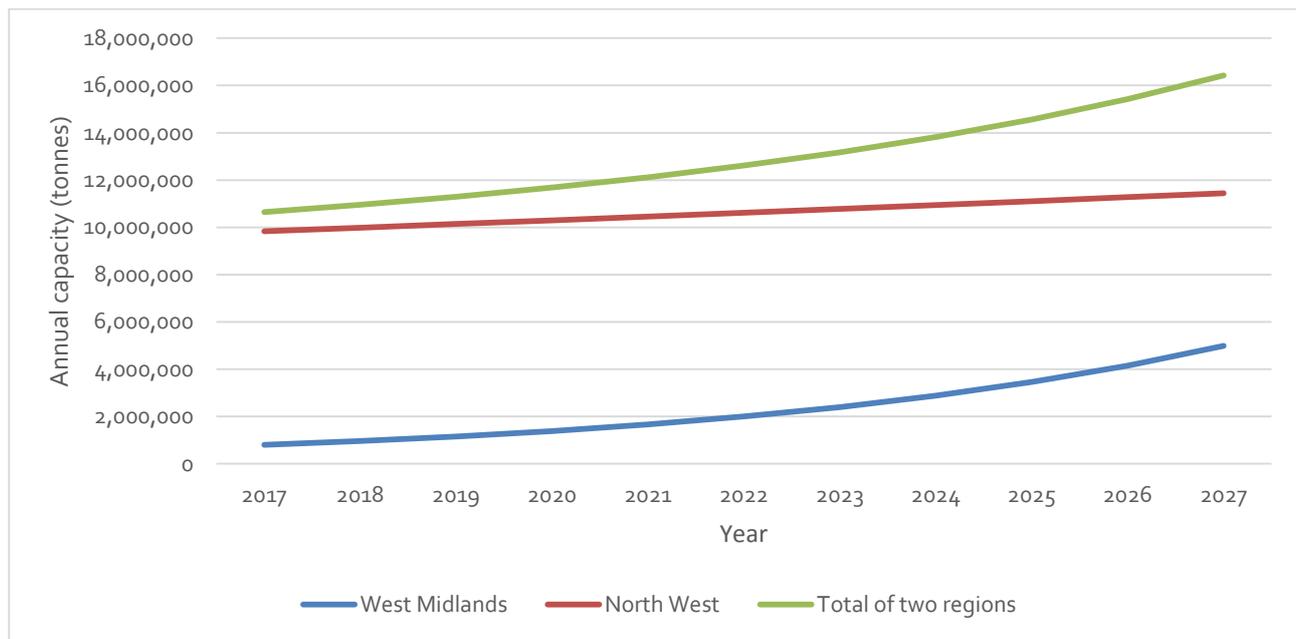
12.2.16 Figure 3 shows that, by 2027, there will be a combined total of approximately 43 million tonnes of non-hazardous waste landfill capacity remaining in the two regions through which the AP2 revised scheme will pass. This is a reduction from approximately 68 million tonnes of non-hazardous waste landfill capacity in 2016, which reflects a gradual decline in non-hazardous waste landfill capacity in both regions.

Hazardous waste landfill capacity

12.2.17 Using the latest available published data for the year 2017 as a starting point, Figure 4 shows projected hazardous waste landfill capacity for the future baseline period 2020 to 2026 (for construction) and the year 2027 (operation). Detailed source data, and local level projections, are presented in the SES2 and AP2 ES, Volume 5: Appendix WM-001-000.

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Figure 4: Projected (future baseline) hazardous waste landfill capacity by region



12.2.18 Figure 4 shows that, by 2027, there will be a combined total of approximately 16 million tonnes of hazardous waste landfill capacity remaining in the two regions through which the AP2 revised scheme will pass. This is an increase from approximately 11 million tonnes of hazardous waste landfill capacity in 2016, which reflects a substantial increase in hazardous waste landfill capacity in the West Midlands and a more gradual increase in the North West.

Effects arising during construction

Avoidance and mitigation measures

12.2.19 In accordance with the draft Code of Construction Practice (CoCP) the nominated undertaker and its contractors will be responsible for managing the waste generated from construction activities.

12.2.20 The nominated undertaker and its contractors will comply with the requirements of the borrow pits restoration strategy (see main ES Volume 5: Appendix CT-009-000) which relates to the excavation, operation and restoration of borrow pits.

Excavated material

12.2.21 Table 13 presents a route-wide summary of the forecast excavated material quantities for the AP2 revised scheme. This is based on the calculated figures for the integrated earthworks design and reflects the balance of excavated material arising from the proposed construction works. A detailed excavated material quantity forecast is provided in SES2 and AP2 ES, Volume 5: Appendix WM-001-000. For the purpose of this assessment, it has been assumed as a worst-case scenario that all surplus excavated material not directed to local placement areas along the route of the AP2 revised scheme will be disposed off-site to landfill.

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Table 13: Forecast excavated material quantities for the AP2 revised scheme, 2020 to 2026

Excavated material management methods	Total quantity original scheme (tonnes)	Total quantity AP2 revised scheme (tonnes)	Proportion of AP2 revised scheme total
Quantity of excavated material reused for engineering and environmental mitigation earthworks (including all topsoil and agricultural subsoil)	39,009,449	41,800,245	92%
Quantity of surplus excavated material for local placement	0	1,992,020	4.4%
Quantity of surplus excavated material for off-site disposal to inert landfill ⁴⁰	674,179	1,614,779	3.5%
Quantity of surplus excavated material for off-site disposal to hazardous landfill	6,306	5,912	0.1%
Total	39,689,934	45,412,956	100%

12.2.22 The AP2 revised scheme will generate approximately 45,412,956 tonnes of excavated material during the period 2020 to 2026. This represents a 14% increase on the quantities reported for the original scheme.

12.2.23 It is estimated that 92% of the excavated material generated by the AP2 revised scheme will be used to satisfy the necessary requirements for fill on a route-wide basis; with a further 4% of the excavated material generated directed to local placement areas along the line of the route. Together, these measures provide for an estimated 96% of the excavation material generated to be managed on-route. This represents a slight decrease from the 98% reported in Volume 3 of the main ES.

12.2.24 The estimated quantity of surplus excavated material that would require off-site disposal to landfill would be less than 4% of the overall excavated material that would be generated on a route-wide basis, based on the current level of design. This will comprise:

- 319,048 tonnes of Class 1 materials⁴¹ not required for use as general railway fill, which would require off-site disposal to inert landfill;
- 1,295,730 tonnes of Class 4 materials⁴² not required to backfill the borrow pits, which would require off-site disposal to inert landfill; and
- 5,912 tonnes of chemically unacceptable U2 materials⁴³ which would require off-site disposal to hazardous landfill.

⁴⁰ All topsoil and agricultural subsoil generated is considered as a valuable material resource. The surplus excavated material reported for off-site disposal to landfill, does not include the quantity of topsoil and agricultural subsoil, which is not currently proposed for reuse in the design of the AP2 revised scheme. It is expected that beneficial reuse opportunities will be found for surplus topsoil and agricultural subsoil, either within the AP2 revised scheme, or off-site in nearby development projects.

⁴¹ As defined by the Specification for Highway Works, Series 601 Classification, Definitions and Uses of Earthworks Materials.

⁴² As defined by the Specification for Highway Works, Series 601 Classification, Definitions and Uses of Earthworks Materials.

⁴³ Materials that are unsuitable for reuse by virtue of an excess concentration of contaminants that render the material 'contaminated' (as defined by statutory Regulation or HS2 project requirements) at the place and environmental setting of its final deposition.

Borrow pits

- 12.2.25 Based on the current level of design, and excavation to the mineral depth required to supplement any shortfall of suitable granular engineering fill material, it is forecast that 8,785,934 tonnes of material will be excavated from borrow pits. It is forecast that the same quantity of excavated material will be used to backfill the borrow pits.

Local placement

- 12.2.26 Local placement comprises areas within the land required for construction of the AP2 revised scheme, on which surplus excavated material would be placed to reduce the need for off-site road transport and disposal of that surplus material and reduce the environmental impacts arising from HGV movements on the highway network.
- 12.2.27 Twenty local placement areas are included in the AP2 revised scheme, with a total placement of approximately 1,992,020 tonnes of surplus excavated material.

Demolition material and waste

- 12.2.28 The AP2 revised scheme will generate approximately 131,827 tonnes of demolition material during the overall construction period of 2020 to 2026. This represents a 2% increase on the quantities reported for the original scheme and results from an increase in the number of demolitions.
- 12.2.29 The quantity of demolition waste that will require off-site disposal to landfill during the overall construction period of 2020 to 2026 will be approximately 13,183 tonnes.
- 12.2.30 The Overview of Demolition Waste in the UK⁴⁴ uses waste data provided by the National Federation of Demolition Contractors to determine that approximately 91% of demolition waste is reused and recycled. This can be accounted for in the most part, by the inert fraction of the waste. The report states that of the remaining 9% of demolition waste produced in the UK, approximately 3% is hazardous and a further 6% of demolition waste is sent to non-hazardous waste landfill.
- 12.2.31 For the purpose of this assessment, it has been assumed that 60% of the quantity of demolition waste requiring off-site disposal to landfill will be non-hazardous waste and 40% will be hazardous waste. Based on this assumption, the quantity of demolition waste and class of landfill to which demolition waste will be sent for disposal is shown in Table 14.

Table 14: Quantity of demolition waste requiring off-site disposal to landfill (by class of landfill), 2020 to 2026

Class of landfill	Total quantity original scheme (tonnes)	Total quantity AP2 revised scheme (tonnes)	Proportion of AP2 revised scheme total
Quantity of demolition waste for off-site disposal to inert waste landfill	0	0	0%

⁴⁴Waste and Resources Action Programme (2009). *Overview of Demolition Waste in the UK*, <http://www.wrap.org.uk/sites/files/wrap/CRWP-Demolition-Report-2009.pdf>

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Class of landfill	Total quantity original scheme (tonnes)	Total quantity AP2 revised scheme (tonnes)	Proportion of AP2 revised scheme total
Quantity of demolition waste for off-site disposal to non-hazardous waste landfill	7,781	7,910	60%
Quantity of demolition waste for off-site disposal to hazardous waste landfill	5,187	5,273	40%
Total	12,968	13,183	100%

Construction waste

- 12.2.32 Construction waste quantities have been estimated based on a waste generation rate derived from industry-wide benchmark performance data procured from the Building Research Establishment Ltd. Using this methodology, the AP2 revised scheme is forecast to generate approximately 440,723 tonnes of construction waste during the construction period of 2020 to 2026. This represents approximately a 2% increase over the quantity reported for the original scheme in Volume 3 of the main ES.
- 12.2.33 The quantity of construction waste that would be diverted from landfill via reuse, recycling and recovery is based on a landfill diversion rate of 90%. It has been assumed, as a reasonable worst-case scenario for the purpose of this assessment that the remaining 10% of construction waste generated would be disposed of off-site to landfill. The quantity of construction waste that would require off-site disposal to landfill during the overall construction period of 2020 to 2026 will be approximately 44,072 tonnes.

Worker accommodation site waste

- 12.2.34 The three proposed worker accommodation sites will generate approximately 1,089 tonnes of worker accommodation site waste during the construction period of 2020 to 2026. This is the same quantity reported for the original scheme in Volume 3 of the main ES.
- 12.2.35 The quantity of worker accommodation site waste that would be diverted from landfill via reuse, recycling and recovery is based on a landfill diversion of 50%. The rationale for this landfill diversion rate is set out in SES2 and AP2 ES Volume 5: Appendix WM-001-000. It has been assumed, as a reasonable worst-care scenario for the purpose of this assessment that the remaining 50% of worker accommodation site waste will require off-site disposal to landfill. The quantity of worker accommodation site waste that would require off-site disposal to landfill during the overall construction period of 2020 to 2026 will be approximately 547 tonnes.

Impact of construction on future baseline waste arisings

Construction, demolition and excavation waste

- 12.2.36 Table 15 provides a summary of material and waste quantities forecast to be generated by construction, demolition and excavation works for the AP2 revised scheme during the period 2020 to 2026.

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Table 15: Summary of material and waste quantities that would be generated by excavation, demolition and construction works, 2020 to 2026

Source	Total quantity of material (tonnes)	Quantity diverted from off-site landfill (tonnes)	Quantity for off-site disposal to landfill (tonnes)
Excavation	45,412,956	43,792,265	1,620,691
Demolition	131,827	118,644	13,183
Construction	440,723	396,650	44,072
Total AP2 revised scheme	45,985,506	44,307,559	1,677,946
Proportion	100%	96%	4%
Total original scheme	40,253,411	39,516,579	736,833
% change from original scheme	14.2%	12.1%	127.7%

12.2.37 Table 15 shows that the AP2 revised scheme will generate approximately 46 million tonnes of excavated material, demolition material and construction waste during the period 2020 to 2026. This represents a 14.2% increase on the excavated material, demolition material and construction waste reported for the original scheme.

12.2.38 More than 96% of the total quantity would be diverted from off-site landfill via reuse, recycling, recovery and local placement, based on current level of design.

12.2.39 The impact of this material and waste generation and its off-site disposal to landfill is shown in Table 16 as the percentage difference between future baseline construction, demolition and excavation waste arisings with and without the AP2 revised scheme.

12.2.40 Future baseline construction, demolition and excavation waste arisings are presented as the total quantity projected to be generated during the period 2020 to 2026. This is to provide a direct comparison with the total quantity of construction, demolition excavation waste that will be generated during construction of the AP2 revised scheme.

Table 16: Impact of material and waste quantities that would be generated by excavation, demolition and construction works, 2020 to 2026

Future baseline scenario with and without the AP2 revised scheme	National change		Regional change ⁴⁵	
	Construction, demolition and excavation waste arisings (tonnes)	Construction, demolition and excavation waste arisings to landfill (tonnes)	Construction, demolition and excavation waste arisings (tonnes)	Construction, demolition and excavation waste arisings to landfill (tonnes)
Future baseline waste arisings 2020 to 2026 with the original scheme	793,157,143	193,776,789	188,547,788	33,480,957
Increase in future baseline waste	+5%	+0.4%	+27%	+2%

⁴⁵ Based on future baseline construction, demolition and excavation waste arisings and construction, demolition and excavation waste to landfill for the aggregated two regions

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Future baseline scenario with and without the AP2 revised scheme	National change		Regional change ⁴⁵	
	Construction, demolition and excavation waste arisings (tonnes)	Construction, demolition and excavation waste arisings to landfill (tonnes)	Construction, demolition and excavation waste arisings (tonnes)	Construction, demolition and excavation waste arisings to landfill (tonnes)
arisings with the original scheme				
Future baseline waste arisings 2020 to 2026 without the AP2 revised scheme	752,903,732 ⁴⁶	193,039,956 ⁴⁷	148,294,377 ⁴⁸	32,744,124 ⁴⁹
AP2 revised scheme material and waste arisings 2020 to 2026	45,412,956	1,620,691	45,412,956	1,620,691
Future baseline waste arisings 2020 to 2026 with the AP2 revised scheme	798,316,688	194,660,447	193,707,333	34,364,815
Increase in future baseline waste arisings with the AP2 revised scheme	+6%	+1%	+31%	+5%

12.2.41 Table 16 shows that the total quantity of construction, demolition and excavation waste generated by the AP2 revised scheme will be equivalent to approximately 6% of national and 31% of regional future baseline construction, demolition and excavation waste arisings during the period 2020 to 2026. This is a 1% increase from the original scheme in relation to national construction, demolition and excavation waste arisings and a 4% increase from the original scheme in relation to regional construction, demolition and excavation waste arisings. These represent small rises on the increases reported for the original scheme.

12.2.42 The total quantity of construction and demolition waste and surplus excavation material generated by the AP2 revised scheme that will require off-site disposal to landfill would be equivalent to approximately 1% of national and 5% of regional future baseline construction, demolition and excavation waste arisings to landfill during that time. This is a 0.5% increase from the original scheme in relation to the national data reported and a 3% increase from the original scheme in relation to the regional data reported. These also represent small rises on the increases reported for the original scheme.

Commercial and industrial waste

12.2.43 The impact of worker accommodation site waste generation and off-site disposal to landfill is shown in Table 17 as the percentage difference between future baseline C&I waste arisings with and without the AP2 revised scheme.

⁴⁶ Based on annual projection of 107,557,676 tonnes nationally as set out in Section 12.2.

⁴⁷ Based on an annual projection of 25,577,137 tonnes nationally as set out in Section 12.2.

⁴⁸ Based on an annual projection of 21,184,911 tonnes for the aggregated two regions as set out in Table 20 Section 15.4 of main ES.

⁴⁹ Based on an annual projection of 4,677,732 tonnes for the aggregated two regions as set out in Table 20 Section 15.4 of main ES.

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12.2.44 Future baseline C&I waste arisings are presented as the total quantity projected to be generated during the period 2020 to 2026. This is to provide a direct comparison with the total quantity of C&I waste that will be generated during construction of the AP2 revised scheme.

Table 17: Impact of C&I waste arisings generated by AP2 revised scheme, 2020 to 2026

Future baseline scenario with and without the AP2 revised scheme	National change		Regional change ⁵⁰	
	C&I arisings (tonnes)	C&I arisings to landfill (tonnes)	C&I arisings (tonnes)	C&I arisings to landfill (tonnes)
Future baseline waste arisings 2020 to 2026 without the AP2 revised scheme	225,400,000 ⁵¹	53,048,573 ⁵²	89,439,000 ⁵³	19,502,000 ⁵⁴
AP2 revised scheme material and waste arisings 2020 to 2026	1,089	544	1,089	544
Future baseline waste arisings 2020 to 2026 with the AP2 revised scheme	225,401,089	53,049,117	89,440,089	19,502,544
Increase in future baseline waste arisings with the AP2 revised scheme	0.0005%	0.0010%	0.0012%	0.0028%
Future baseline waste arisings 2020 to 2026 with the original scheme	272,833,089	64,212,384	89,440,089	19,502,544
Increase in future baseline waste arisings with the original scheme	0.0004%	0.0008%	0.0012%	0.0028%

12.2.45 Table 17 shows that the total quantity of worker accommodation site waste generated by the AP2 revised scheme will be equivalent to less than 0.01% of national and regional future baseline C&I waste arisings during the period 2020 to 2026.

12.2.46 The total quantity of worker accommodation site waste that will require off-site disposal to landfill will be equivalent to less than 0.01% of national and regional future baseline C&I waste arisings to landfill during that time.

Likely significant environmental effects

Inert waste landfill capacity

12.2.47 The total quantity of inert waste arising from the construction of the AP2 revised scheme that will require off-site disposal to landfill during the period 2020 to 2026 is approximately 1,614,779 tonnes (see Table 18). This represents an increase of 934,294 tonnes over the quantity reported for the original scheme. Inert waste will account for approximately 96% of the total construction, demolition and excavation waste requiring off-site disposal to landfill.

⁵⁰ Based on future baseline C&I waste arisings and C&I waste to landfill for aggregated two regions.

⁵¹ Based on annual projection of 32,200,000 tonnes nationally as set out in Section 12.2.

⁵² Based on annual projection of 7,578,368 tonnes nationally as set out in Section 12.2.

⁵³ Based on an annual projection of 12,777,000 tonnes for the aggregated two regions as set out in Table 20 Section 15.4 of main ES.

⁵⁴ Based on an annual projection of 2,786,000 tonnes for the aggregated two regions as set out in **Error! Reference source not found.** 20 Section 15.4 of main ES.

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Table 18: Quantity of waste requiring off-site disposal to inert landfill, 2020 to 2026

Waste source	Waste quantity original scheme (tonnes)	Waste quantity AP2 revised scheme (tonnes)
Excavation	680,485	1,614,779

12.2.48 The draw-down of inert waste landfill void space as a result of the AP2 revised scheme will occur over a period of several years, starting initially with enabling works followed by earthworks such as tunnelling.

12.2.49 Off-site disposal of inert surplus excavated material to landfill will result in an overall reduction of inert waste landfill void space of 1,614,779 tonnes. This will be equivalent to a 4% reduction in inert waste landfill capacity void space across the aggregated two regions according to the amount of capacity projected to be available at the end of construction in 2025 (approximately 43 million tonnes).

12.2.50 It is considered that there will be sufficient inert waste landfill capacity available in the aggregated two regions to accept the forecast quantity of inert surplus excavated material for off-site disposal to landfill.

12.2.51 Significance criteria for inert waste landfill capacity, state that a local-scale reduction in inert waste landfill void space capacity of up to two million tonnes per annum may be of low importance in the decision-making process, but relevant to the detailed design and mitigation of a project.

12.2.52 In accordance with these significance criteria, the likely environmental effects associated with the off-site disposal to landfill of inert surplus excavated material generated by construction of the AP2 revised scheme will be minor adverse; this remains unchanged from the original scheme reported in Volume 3 of the main ES.

Non-hazardous waste landfill capacity

12.2.53 The total quantity of non-hazardous waste arising from the construction of the AP2 revised scheme that will require off-site disposal to landfill during the period 2020 to 2026 is approximately 52,529 tonnes (see Table 19). This represents an increase of 821 tonnes (2%) over the quantity reported for the original scheme.

12.2.54 The majority (approximately 84%) would comprise construction waste. Other quantities of non-hazardous waste would be generated by demolition and worker accommodation activities.

Table 19: Quantity of waste requiring off-site disposal to non-hazardous landfill, 2020 to 2026

Waste source	Waste quantity original scheme (tonnes)	Waste quantity AP2 revised scheme (tonnes)	Proportion by source of AP2 revised scheme waste quantity
Excavation	0	0	0%
Demolition	7,781	7,910	15%
Construction	43,380	44,072	84%
Worker accommodation sites	547	547	1%

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Waste source	Waste quantity original scheme (tonnes)	Waste quantity AP2 revised scheme (tonnes)	Proportion by source of AP2 revised scheme waste quantity
Total	51,708	52,529	100%

- 12.2.55 The AP2 revised scheme tonnage represents a 2% difference in the non-hazardous waste tonnage reported for the original scheme.
- 12.2.56 Off-site disposal of non-hazardous construction and demolition waste and surplus excavated material would result in an overall reduction of non-hazardous waste landfill void space of 52,529 tonnes. This would be equivalent to a 0.1% reduction in non-hazardous waste landfill capacity void space across the aggregated two regions according to the amount of capacity projected to be available at the end of construction in 2026 (approximately 45 million tonnes).
- 12.2.57 It is considered that there would be sufficient non-hazardous waste landfill capacity available in the aggregated two regions to accept the forecast quantity of non-hazardous surplus construction, demolition and excavation waste for off-site disposal to landfill.
- 12.2.58 Non-hazardous waste will be generated by a range of construction activities that will occur throughout the duration of construction of the AP2 revised scheme. Consequently, the draw-down of non-hazardous waste landfill void space as a result of the AP2 revised scheme would occur over a period of several years and is unlikely to draw down projected capacity to an extent where there is an immediate, significant need for additional non-hazardous waste landfill capacity to be made available in these areas.
- 12.2.59 Significance criteria for non-hazardous waste landfill capacity state that a regional-scale reduction in non-hazardous waste landfill void space capacity of up to 50,000 tonnes per annum may be judged to be of low importance in the regional planning context.
- 12.2.60 According to the significance criteria applicable to non-hazardous waste landfill capacity, the likely environmental effects associated with the off-site disposal to landfill of non-hazardous surplus excavated material, construction and demolition waste generated by the AP2 revised scheme will be minor adverse; this remains unchanged from the original scheme reported in Volume 3 of the main ES.

Hazardous waste landfill capacity

- 12.2.61 The total quantity of hazardous waste arising from the construction of the AP2 revised scheme requiring off-site disposal to landfill during the period 2020 to 2026 is approximately 11,185 tonnes (see Table 20). This represents a decrease of 308 tonnes (approximately 3%) over the quantity reported for the original scheme. This quantity comprises of Unacceptable Class U2 surplus excavated material which is material that will be unsuitable for use in the construction of the AP2 revised scheme due to its hazardous properties, and hazardous waste generated by demolition activities.

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Table 20: Quantity of waste requiring off-site disposal to hazardous waste landfill, 2020 to 2026

Waste source	Waste quantity original scheme (tonnes)	Waste quantity AP2 revised scheme (tonnes)	Proportion by source of AP2 revised scheme waste quantity
Excavation	6,306	5,912	53%
Demolition	5,187	5,273	47%
Construction	0	0	0%
Worker accommodation sites	0	0	0%
Total	11,493	11,185	100%

12.2.62 The AP2 revised scheme tonnage represents a 3% difference in the hazardous waste tonnage reported for the original scheme.

12.2.63 Off-site disposal of hazardous waste will result in an overall reduction of hazardous waste landfill void space of approximately 11,185 tonnes throughout the AP2 revised scheme construction period. This would be equivalent to a 0.07% reduction in hazardous waste landfill void space across the aggregated two regions according to the amount of capacity projected to be available at the end of construction in 2026 (approximately 15 million tonnes).

12.2.64 Significance criteria for hazardous waste landfill capacity state that a regional-scale reduction in hazardous waste landfill void space capacity of up to 20,000 tonnes per annum may be judged to be of low importance in the regional planning context.

12.2.65 According to the significance criteria applicable to hazardous waste landfill capacity, the likely environmental effects associated with the off-site disposal to landfill of hazardous surplus construction, demolition and excavation waste generated by the AP2 revised scheme will be minor adverse; this remains unchanged from the original scheme reported in Volume 3 of the main ES.

Other mitigation measures

12.2.66 Management of CDEW and worker accommodation site waste generated by the AP2 revised scheme will be subject to the Environmental Minimum Requirements (EMR), as discussed within Volume 1.

12.2.67 Some of the non-hazardous waste generated by the construction of the AP2 revised scheme will be suitable for incineration (with energy recovery). This will reduce reliance on non-hazardous waste landfill capacity.

12.2.68 A reasonable worst-case approach has been taken in determining the quantity of hazardous waste for off-site disposal to landfill. However, detailed chemical sampling and laboratory analysis, as part of future ground investigation works, may allow the hazardous waste to be reclassified as non-hazardous waste. This will reduce reliance on hazardous waste landfill capacity.

12.2.69 It is likely that a large proportion of the hazardous demolition waste will comprise asbestos containing materials. This material could be disposed of at non-hazardous landfill sites within a separate cell for Stable Non-Reactive Hazardous Waste

(SNRHW)⁵⁵ providing it meets SNRHW waste acceptance criteria in accordance with the Landfill Directive⁵⁶ and the Proposal for a Council Decision Establishing Criteria and Procedures for the Acceptance of Waste at Landfills⁵⁷. This will reduce reliance on hazardous waste landfill capacity.

Summary of likely residual significant environmental effects

- 12.2.70 On the basis of the other mitigation measures proposed, the likely residual significant environmental effects from construction will be:
- minor adverse and not significant in relation to inert waste landfill capacity;
 - minor adverse and not significant in relation to non-hazardous waste landfill capacity; and
 - minor adverse and not significant in relation to hazardous waste landfill capacity.
- 12.2.71 There are no new or different likely residual significant environmental effects compared to those reported in the main ES.

Cumulative effects

Phase 2a and Phase One

- 12.2.72 The cumulative effects assessment has taken account of any Phase One construction works necessary to connect Phase One to the AP2 revised scheme that will be constructed at the same time as the AP2 revised scheme (i.e. between the years 2020 and 2026). During this period Phase One and Phase 2a AP2 revised schemes will have a simultaneous requirement for landfill disposal capacity of any construction waste generated during that period.
- 12.2.73 A description of the Phase One construction works that have been taken into account in the cumulative effects assessment is provided in SES2 and AP2 ES Volume 5: Appendix WM-001-000.
- 12.2.74 Cumulative effects have been considered on the basis of professional judgement according to the nature of the construction activities proposed.
- 12.2.75 These construction works will produce CDEW, a proportion of which will require disposal to landfill. In line with relevant policy, it is anticipated that these works will seek to minimise the off-site disposal of waste to landfill and manage waste in accordance with the waste hierarchy.

⁵⁵ A non-hazardous waste landfill with a SNRHW cell allows for hazardous waste that has been stabilised and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes and in accordance with Council Decision 2003/33/EC (Council Decision of 19 December 2002 Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Pursuant to Article 16 of Annex II to Directive 1999/31/EC). For further details, see Environment Agency (2010) *Waste Acceptance at Landfills: Guidance on Waste Acceptance Procedures and Criteria*. November 2010, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296422/geho111obtew-e-e.pdf

⁵⁶ Directive 1999/31/EC of 26 April 1999 on the landfill of waste, European Council.

⁵⁷ Proposal for a Council Decision Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Pursuant to Article 16 and Annex II of Directive 1999/31/EC on the landfill of waste, European Commission.

- 12.2.76 It is considered that waste requiring off-site disposal to landfill, will be managed according to logistical and cost constraints regarding the availability of landfill capacity. These constraints limit the distance that waste will be transported by road. It is considered that waste generated by the Phase One scheme is only of relevance when it is generated in a geographic area in which the available landfill capacity is likely to be considered for use by both the AP2 revised scheme and the Phase One scheme. In this assessment, it is considered that this area of overlap comprises the West Midlands regional area.
- 12.2.77 The following quantities of waste have been forecast to be generated by the Phase One construction works in the West Midlands regional area⁵⁸:
- no inert waste⁵⁹;
 - 345,660 tonnes of non-hazardous waste (38,407 tonnes per annum); and
 - 150,682 tonnes of hazardous waste (16,742 tonnes per annum).
- 12.2.78 It is considered in all classes of landfill that there will be sufficient capacity available in the West Midlands region to accept the forecast quantity of waste from both the AP2 revised scheme and Phase One.
- 12.2.79 The cumulative effects on the available inert, non-hazardous and hazardous landfill capacities are considered to be as identified for the main assessment i.e. minor adverse and not significant.

Phase 2a and other committed developments

- 12.2.80 The methodology used to develop the future baseline landfill capacities during the proposed construction period, takes account of waste generation trends driven by developments in the respective regional areas. It is considered in this cumulative assessment that none of the committed developments are of sufficient scale to disrupt these trends and are therefore considered to comprise part of the future baseline against which the AP2 revised scheme has already been assessed.

Effects arising from operation

- 12.2.81 None of the AP2 amendments result in a change to the operational waste generated by the original scheme, as reported in Volume 3 of the main ES.
- 12.2.82 The non-hazardous landfill capacity projected to be available in 2027 for the off-site disposal of operational waste has increased compared to that reported in Volume 3 of the main ES, from approximately 49 million tonnes to approximately 51 million tonnes. This increase in non-hazardous landfill capacity does not result in any new or

⁵⁸ HS2 Ltd (2015). *High Speed Rail (London - West Midlands) Supplementary Environmental Statement 3 and Additional Provision 4 Environmental Statement, Volume 5 Technical appendices Waste and material resources WM-001-000 Annex 1*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/466978/Waste_and_material_resources_WM-001-000_WM001-000_annex_WM-002-000.pdf

⁵⁹ HS2 Ltd (2015). *High Speed Rail (London - West Midlands) Supplementary Environmental Statement 3 and Additional Provision 4 Environmental Statement - Volume 3 Route-wide effects, Table 18*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/466903/SES3-AP4_ES_Volume_3_Route-wide_effects.pdf

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different likely significant environmental effects with respect to the operational waste generated by the AP2 revised scheme.

13 Water resources and flood risk

13.1 Introduction

13.1.1 Volume 3 of the main ES provided an assessment of the route-wide impacts and likely significant effects related to surface water and groundwater resources (quality and quantity) and flood risk. It included consideration of the following issues:

- the risk to water resources associated with accidents or spillages from trains during operation of the original scheme;
- a summary of how the original scheme complies with the statutory requirements of the Water Framework Directive (WFD)⁶⁰; and
- route-wide flood risk related to alignment of the original scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)⁶¹.

13.1.2 Section 6 of this volume reports that the SES2 changes will not result in any new or different likely significant effects on surface water and groundwater resources (quality and quantity) and flood risk compared to those reported in Volume 3 of the main ES, as amended by SES1.

13.1.3 This section of the AP2 ES identifies any new or different likely significant effects on surface water and groundwater resources (quality and quantity) and flood risk compared to those reported in Volume 3 of the main ES as amended by SES1 and SES2, due to the AP2 amendments.

13.2 Changes to the assessment

13.2.1 A scoping exercise was undertaken to determine whether any of the AP2 amendments would act in combination to lead to new or different regional or route-wide likely significant effects on water resources or flood risk.

13.2.2 Two AP2 amendments were identified with the potential to change the assessment reported in the main ES as amended by SES1 relating to route-wide WFD compliance:

- Additional land and a change to Bill powers required to divert Common Lane to the A515 Lichfield Road (AP2-001-006). The amendment requires an extension of Common Lane to the A515 Lichfield Road realignment, which will require new 13m long culverts to cross the Bourne Brook; and
- Additional land required for a water treatment facility at the Severn Trent Water Limited (STW) Mill Meece borehole facility (AP2-003-019). The access road to Mill Meece treatment plant will cross the Unnamed tributary of Meece Brook 3 with an approximately 21m long culvert.

⁶⁰ HM Government (2017). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, The Stationery Office.

⁶¹ Department for Communities and Local Government (2018). National Planning Policy Framework. London, Her Majesty's Stationery Office. The assessment work undertaken after July 2018 has taken account of the amendments within the Revised NPPF.

13.3 Route-wide WFD compliance

- 13.3.1 The impact of the AP2 amendments affecting Bourne Brook and Unnamed tributary of Meece Brook 3 is described in detail in AP2 ES Volume 5: Appendix WR-001-000, which forms an addendum to the WFD compliance assessment report submitted as part of the main ES. A summary is provided below.
- 13.3.2 Two AP2 amendments were considered to have the potential to affect the WFD status and status objectives. One of these changes (AP2-001-006) is located on the Bourne Brook which is located within the Bourne-Bilson Brook Catchment (tributary of Trent) (GB104028047270⁶²) WFD surface water body and one is located on a previously unassessed tributary of Meece Brook (located to the east of the West Coast Main Line at Mill Meece) within the Meece Brook from Source to Chatcull Brook (GB104028053080⁵⁰) WFD surface water body.
- 13.3.3 Additional land permanently required to divert Common Lane to the A515 Lichfield Road (AP2-001-006) requires an extension of Common Lane to the A515 Lichfield Road realignment. This amendment will require a new 13m long culvert on the Bourne Brook. The amendment is shown in map CT-06-202 in the SES2 and AP2 ES Volume 2, CA1 Map Book.
- 13.3.4 Additional land permanently required for a water treatment facility at the Severn Trent Water Mill Meece borehole facility (AP2-003-019) includes a new 21m long access road culvert to be constructed on the unnamed tributary of Meece Brook as part of a new treatment plant that will provide alternative supply to Whitmore borehole. This amendment is shown in map CT-06-225-L3, in the SES2 and AP2 ES Volume 2, CA3 Map Book.
- 13.3.5 The WFD Addendum has concluded that the AP2 revised scheme will not cause a deterioration of the current status of the relevant Bourne-Bilson Brook Catchment (tributary of Trent) (GB104028047270⁶²) or Meece Brook from Source to Chatcull Brook (GB104028053080⁵⁰) surface water bodies, or prevent these water bodies from achieving its status objectives.
- 13.3.6 The AP2 revised scheme will therefore remain compliant with the objectives of the WFD. No instances where an Article 4.7 test⁶³ is required have been identified in this assessment.

⁶² Environment Agency's water body identification number.

⁶³ Article 4.7 of the WFD states that Member States will not be in breach of the Directive when failure to meet its environmental objectives is the result of either new modifications to the physical characteristics of a water body or as a result of new human sustainable development, on the proviso that the modifications or new development proposed are compliant with four key conditions as outlined in Annex B6. Thus, if the AP2 revised scheme cannot demonstrate that there will be no deterioration, then a derogation will need to be prepared under Article 4.7 to ensure that the AP2 revised scheme is compliant under the WFD legislation and the Bill can pass through Parliament.

14 Phase One, Phase 2a and Phase 2b combined impacts

14.1 Introduction

- 14.1.1 Volume 3 of the main ES presented a tabulated summary of the potential total impacts of Phase One, Phase 2a original scheme and Phase 2b on a range of environmental receptors. The Phase One data was taken from that reported in the Phase One SES₄ and AP₅ ES⁶⁴. Impacts of the Phase 2a original scheme were based on design data and assessments contained within the Phase 2a main ES published in July 2017⁶⁵. The quantification of the impacts of Phase 2b was derived from the Phase 2b Sustainability Statement⁶⁶.
- 14.1.2 Volume 3 of the SES₁ and AP₁ ES reported that the AP₁ revised scheme would result in very minor or negligible changes to the combined impact figures presented in Volume 3 of the main ES.
- 14.1.3 This section of the report identifies any changes to the combined impact figures compared to those reported in Volume 3 of the main ES as amended by SES₁, due to the AP₂ amendments.

14.2 Summary of changes to combined impacts

- 14.2.1 Table 21 presents a summary of the potential total impacts of Phase One, the Phase 2a AP₂ revised scheme and Phase 2b on a range of environmental receptors. The Phase One data has been taken from the Phase One SES₄ and AP₅ ES. The Phase 2a AP₂ revised scheme data is taken from the SES₂ and AP₂ ES. Since publication of the Phase 2a main ES, the working draft ES for Phase 2b of HS2 has been published. Data regarding the potential impacts of Phase 2b has therefore been taken from this latest document.

Table 21: Combined impacts of Phase One, Phase 2a AP₂ revised scheme and Phase 2b

	Phase One	Phase 2a AP ₂ revised scheme	Phase 2b	Overall total (Phase One, Phase 2a AP ₂ revised scheme and Phase 2b total)
Route characteristics (km)				
Total	216	58	279.3	553.3
At grade	0	0 ⁶⁷	19.3	19.3
Tunnel	49.5	2.9 ⁶⁸	21.7	74.1

⁶⁴ HS2 Ltd (2015). *High Speed Rail (London - West Midlands) Supplementary Environmental Statement 4 and Additional Provision 5 Environmental Statement. Volume 3. Route-wide effects. December 2015.*

⁶⁵ HS2 Ltd (2017). *High Speed Rail (West Midlands - Crewe) Environmental Statement*, <https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement>

⁶⁶ Temple-RSK (2016). *High Speed Rail: Phase 2b Preferred Route. Sustainability Statement including Post Consultation Update. Volume 1: Main Report of the Appraisal of Sustainability. A report by Temple-RSK for HS2 Ltd. November 2016*

⁶⁷ Sections that were at grade in the AP₁ revised scheme are now embankment and cutting. Related to AP₂-004-002.

⁶⁸ Increase related to AP₂-004-002.

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	Phase One	Phase 2a AP2 revised scheme	Phase 2b	Overall total (Phase One, Phase 2a AP2 revised scheme and Phase 2b total)
Cutting	74.7	28.3 ⁶⁹	89.4	192.4
Viaduct	16.3	5.5	38.5	60.3
Embankment	62.5	21.3 ⁷⁰	110.4	194.2
Property and settlements				
Demolitions (residential)	326 dwellings (218 buildings)	27 dwellings ⁷¹	536	889
Demolitions (community)	19 community facilities	0 community facilities	8 community facilities ⁷²	27
Demolitions (commercial/retail/manufacturing/industrial/miscellaneous)	372 units (309 buildings) ⁷³	68 units ⁷⁴	564 ⁷⁵	986
Total demolitions	546 buildings	95 buildings ⁷⁶	1,108 ⁷⁷	1,742
Employment				
Permanent jobs created	2,200 ⁷⁸	140	Refer to footnote ⁷⁹	2,340
Construction jobs created	14,600 ⁸⁰	1,920 ⁸¹	8,870	25,390
Jobs displaced	7,950 ⁸²	25 ⁸³	11,600	19,575
Noise				
Monetary valuation of noise impacts	n/a ⁸⁴	£-3.12m	Refer to footnote ⁸⁵	-

⁶⁹ Increase related to amendment AP2-004-002.

⁷⁰ Increase related to amendment AP2-004-002.

⁷¹ One additional residential demolition related to amendment AP2-002-002.

⁷² Does not include all community facilities lost as some lie within commercial properties lost.

⁷³ This figure includes some properties which also provide community resources, e.g. public house, local services.

⁷⁴ Increase a result of 22 additional commercial demolitions and three commercial demolitions no longer required. This figure includes the demolition of 18 timber clad buildings at the former Westwood school site to facilitate re-development of the site for the replacement Mayfield Children's Home.

⁷⁵ Includes total of residential, community and miscellaneous buildings and structures including outbuildings associated with residential properties and structures such as pylons and wind turbines for example.

⁷⁶ Includes total of residential, community, commercial and miscellaneous buildings including outbuildings associated with residential properties.

⁷⁷ Includes total of residential, community, commercial and miscellaneous buildings including outbuildings associated with residential properties and structures such as pylons and wind turbines for example.

⁷⁸ Indicative direct operational employment figure was estimated to the nearest 100 jobs.

⁷⁹ Value not presented in the Phase 2b Sustainability Statement nor assessed in the Phase 2b working draft ES. Total direct and indirect permanent jobs will be reported in the Phase 2b formal ES.

⁸⁰ Number reported as an approximate equivalent of permanent full time construction jobs.

⁸¹ Based on net changes to average employment levels and expected durations at construction compounds.

⁸² Jobs displaced comprise jobs relocated elsewhere in the UK economy and jobs lost, due to land being acquired for the construction and operation of the scheme (see the main ES, Volume 3, Section 11 for details).

⁸³ Based on the removal of two significant adverse effects at Staffordshire Showground and Mayfield House both located in the Colwich to Yarlet community area.

⁸⁴ The assessment method has materially changed since that used for the AP5 ES (December 2015) and hence the levels are not directly comparable.

⁸⁵ Value not presented in the Phase 2b Sustainability Statement nor assessed in the Phase 2b working draft ES. To be reported in the Phase 2b formal ES.

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Landscape				
AONB crossed at surface (km)	7.6	0	0	7.6
Cultural heritage				
Scheduled Monuments directly affected	1	0	1	2
Registered Battlefields directly affected	1	0	0	1
Grade I and II* structures directly affected	2	0	0	2
Grade II structures directly affected	17	4 ⁸⁶	12	32
Registered Parks and Gardens directly affected	2	0	0	2
Conservation Areas directly affected	2	4	12	18
Biodiversity and wildlife				
Natura 2000 sites affected	0	0	1	1
SSSIs directly affected	3	0	12	1
Habitats of principal importance directly affected	41	99 ⁸⁷	Refer to footnote ⁸⁸	145
Ancient Woodlands directly affected	32	11 ⁸⁹	19 ⁹⁰	62
Water resources and flood risk				
Major ⁹¹ rivers diverted	8	0	1	9
Route through Flood Zone 3 (km)	12.0	2.4	20	34.4
Station/depot occupation of Flood Zone 3 (ha)	2.1	0.6	2.49	5.19
Cutting or tunnel through SPZ 1 or 2 (km)	6.7	0.6	0.6	7.9
Land use resources				
Active landfills crossed	0	0	6	6

⁸⁶ An additional milepost is affected as a result of the AP2 revised scheme (amendment AP2-004-003).

⁸⁷ This figure is the number of distinct areas of habitat of principal importance (e.g. individual qualifying grasslands and woodlands) that are within, or partially within, the land required for the AP2 revised scheme.

⁸⁸ Value not presented in the Phase 2b Sustainability Statement nor assessed in the Phase 2b working draft ES. To be reported in the Phase 2b formal ES.

⁸⁹ The additional ancient woodland relates to a potential ancient woodland site. Amendment AP-001-015 includes the temporary diversion of an existing power line which runs over this woodland. The works will involve lowering the height of any trees that would otherwise infringe on minimum clearances; the wholesale clearance of vegetation and removal of ancient woodland soils would be avoided.

⁹⁰ Relates to Ancient Woodland Inventory sites only.

⁹¹ Major rivers are defined, in the context of this table, as those with a catchment area greater than 50km² at the point of the route crossing.

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Grade 1 and 2 agricultural land (km)	22.0	9.9	20.7 ⁹²	52.6
Waste and material resources				
Excavated material (million m ³)	63.4 ⁹³	18.9 ⁹⁴	16.0	98.3
Concrete (million tonnes)	13.04	2.10	4.65	19.79
Steel (million tonnes)	1.30	0.13	0.51	1.94

⁹² The distance of Grade 1 and 2 agricultural land crossed is currently based on publicly available information and will be confirmed in the formal ES once agricultural land surveys are complete.

⁹³ This figure is the total quantity of excavated material that will be generated from the construction of Phase One. This includes excavated material that will be reused in the construction process as well as excavated material that will be made available for use off-site or disposed of on or off site.

⁹⁴ This figure is the estimated quantity of excavated material excluding top soil and sub-soil that will be generated from the construction of the AP2 revised scheme (including waste generated as a result of SES2 changes and AP2 amendments). It includes excavated material that will be reused in the construction process as well as excavated material that may require off-site disposal.

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