

HIGH SPEED RAIL (LONDON - WEST MIDLANDS)

Supplementary Environmental Statement 3 and
Additional Provision 4 Environmental Statement

Volume 2 | Community forum area reports

CFA7 Colne Valley

October 2015

SES3 and AP4 ES 3.2.1.7



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Department
for Transport

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Structure of the HS₂ Supplementary Environmental Statement 3 and Additional Provision 4 Environmental Statement

The Supplementary Environmental Statement 3 (SES₃) and Additional Provision 4 Environmental Statement (AP₄ ES) comprises:

- non-technical summary (NTS). This provides a summary in non-technical language of the SES₃ (Part 1) and AP₄ ES (Part 2) and of any likely significant environmental effects, both beneficial and adverse, which are new or different to those reported in the High Speed Two (HS₂) Phase One Environmental Statement (ES) submitted to Parliament in November 2013 in support of the hybrid Bill ('the Bill') for Phase One of HS₂ (hereafter referred to as 'the main ES') as updated by subsequent SES and AP ES documents;
- Volume 1: Introduction to the SES₃ and AP₄ ES. This introduces the supplementary environmental information and design changes included within the SES₃ and amendments, which have resulted in the need to amend the Bill, within the AP₄ ES. It also explains any changes to the scope, methodology, assumptions and limitations required for the environmental assessment;
- Volume 2: community forum area (CFA) reports and map books. These describe the supplementary environmental information and design changes included within the SES₃ (Part 1) and amendments within the AP₄ ES (Part 2). Any new or different likely significant environmental effects arising from these changes and amendments in each CFA, compared to those reported in the main ES, as updated by SES and SES₂ documents (and SES₃ for the AP₄ amendments) are reported. The AP₁, AP₂ and AP₃ amendments are also taken into account where relevant. In addition, the main local alternatives that have been considered are described, where relevant;
- Volume 3: route-wide effects. This reports new or different likely significant route-wide effects arising from the supplementary environmental information and design changes included within the SES₃ (Part 1) and amendments within the AP₄ ES (Part 2) compared to those reported in the main ES as updated by SES and SES₂ (and SES₃ for the AP₄ amendments). The AP₁, AP₂ and AP₃ amendments are also taken into account where relevant;
- Volume 4: off-route effects. This reports new or different likely significant off-route effects arising from the supplementary environmental information and design changes included within the SES₃ (Part 1) and amendments within the AP₄ ES (Part 2) compared to those reported in the main ES as updated by SES

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and SES₂ (and SES₃ for the AP₄ amendments). The AP₁, AP₂ and AP₃ amendments are also taken into account where relevant;

- Volume 5: appendices and map books. This contains environmental information and associated maps in support of the other volumes of the SES₃ and AP₄ ES; and
- glossary of terms and list of abbreviations. This contains any new or different terms and abbreviations used throughout the SES and AP ES reports, additional to those included in the main ES.

Structure of this report

This volume of the SES₃ and AP₄ ES is divided into CFA reports, which are in turn divided into two parts.

Part 1 provides supplementary environmental information relating to:

- new baseline information with respect to ecological and traffic and transport surveys; and
- changes to the design or construction assumptions which do not require changes to the Bill.

Part 1 of this CFA report includes, where relevant:

- a description of the changes or updates within the CFA that have triggered the need for reassessment;
- an assessment of the environmental effects of the changes for relevant environmental topics considering the:
 - scope, assumptions and limitations of the SES₃ assessment;
 - changes of relevance to the assessment;
 - environmental baseline;
 - effects arising during construction;
 - effects arising from operation; and
 - mitigation and residual effects; and
- a summary of any new or different likely residual significant effects as a result of the changes.

Part 2 of this CFA report provides environmental assessment information relating to proposed amendments to the design, which have resulted in the need to alter the powers conferred by the Bill. The following is included where relevant:

- a summary of the proposed amendments within each CFA that have triggered the need for reassessment;
- a description of each amendment;
- an assessment of the environmental effects of each amendment for relevant environmental topics considering the:
 - scope, assumptions and limitations of the AP₄ ES assessment;
 - environmental baseline;
 - effects arising during construction;
 - effects arising from operation; and
 - mitigation and residual effects

- a summary of any new or different likely residual significant effects as a result of each proposed amendment.

1 Introduction

- 1.1.1 The Bill for high speed rail between London and the West Midlands was submitted to Parliament together with the main ES in November 2013. The AP1 ES, which was submitted in September 2014, contained generally minor amendments to the design of the original scheme (i.e. the scheme submitted in November 2013) in CFAs 7 – 26. The SES and AP2 ES which was submitted in July 2015, updated the main ES and contained a number of further amendments to the design of the original scheme in CFAs 4 – 26. The SES2 and AP3 ES which was submitted in September 2015, contained further updates to the main ES and reported the assessment of a number of amendments to the design of the original scheme in CFAs 1 – 5.
- 1.1.2 Since the submission of the main ES and subsequent SES and AP documents, updates to environmental baseline information and changes to scheme design or assumptions have occurred, which may lead to new or different significant effects. These effects, depending on the type of change, are reported in the SES3 (Part 1) or AP4 ES (Part 2) of this document, where they occur.
- 1.1.3 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 One of HS2.
- 1.1.4 In order to differentiate between the original scheme and the subsequent changes, the terms set out in Table 1 are used:

Table 1: Scheme definitions

Scheme name	Definition	Relevant CFAs
the original scheme	the Bill scheme submitted to Parliament in November 2013, which was assessed in the main ES	1 – 26
the AP1 revised scheme	the original scheme as amended by the AP submitted in September 2014	7 – 26
the SES scheme	the original scheme with the design changes described in the SES submitted in July 2015	4 – 26
the AP2 revised scheme	the SES scheme as amended by the AP2 submitted in July 2015	4 – 26
the SES2 scheme	the original scheme as updated by the SES scheme, with the design changes described in the SES2 submitted in September 2015	1 - 5 (i.e. this applies in the London area only)
the AP3 revised scheme	the SES2 scheme as amended by the AP3 submitted in September 2015	1 – 5 (i.e. this applies in the London area only)
the SES3 scheme	the SES2 scheme with the design changes described in the SES3 submitted in October 2015	4 – 26

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Scheme name	Definition	Relevant CFAs
the AP ₄ revised scheme	the SES ₃ scheme as amended by the AP ₄ submitted in October 2015	4 – 26

1.1.5 SES₃ (Part 1 of this report) contains updated environmental baseline information and describes changes to the scheme that have occurred within the current limits and powers of the Bill, and therefore do not require an AP to the Bill. This includes:

- new baseline information with respect to ecological and traffic and transport surveys; and
- changes to the design or to construction assumptions which do not require changes to the Bill.

1.1.6 Design changes assessed within the SES₃ for this CFA include:

- scheme elements: a reduction in the land required for construction of the scheme;
- roads: changes to construction traffic routes; and
- utilities: further information on the design or construction of utilities works.

1.1.7 The changes are described in Part 1 under a series of sub-headings, and assessed on a topic-by-topic basis using the same approach adopted in the main ES.

1.1.8 The purpose of SES₃ is to provide an assessment of any new or different likely significant environmental effects arising from the changes described.

1.1.9 There were no SES₂ changes in this CFA, so the SES₃ changes are compared to the SES scheme. There were AP₁ and AP₂ amendments, so these are taken into account as appropriate.

1.1.10 The AP₄ ES (Part 2 of this report) describes the likely significant effects of amendments to the design of the scheme, which require the use of land outside the original limits of the Bill, additional access rights, or other extensions to the powers conferred by the Bill, making it necessary to submit an AP to the Bill.

1.1.11 The amendments assessed within the AP₄ ES for this CFA include:

- access arrangements: a new haul road; improved accommodation access proposed by the original scheme;
- roads and public rights of way (PRoW): changes to construction traffic flows; changes to a bridleway;
- water resources and drainage: the provision of turbidity treatment plant; changes to drainage; and
- changes to the location of temporary stockpiling during construction and to sustainable placement.

1.1.12 The AP₄ ES assesses each amendment separately for all relevant topics. The purpose of the AP₄ ES is to provide an assessment of any new or different likely significant

environmental effects arising from the amendments compared to the SES₃ scheme, taking into account AP₁, AP₂ and AP₃ amendments where relevant.

- 1.1.13 The standard measures that will be used to mitigate likely significant adverse environmental effects during construction and operation of the scheme are described in the main ES, Volume 1, Section 9 and the draft Code of Construction Practice (CoCP) submitted in support of the Bill. Implementation of these measures has been assumed in this SES₃ and AP₄ ES.

Part 1: Supplementary Environmental Statement 3

2 Summary of changes

2.1 New environmental baseline information

Ecology

- 2.1.1 Details of all amphibian surveys undertaken in this area during 2015 are provided in SES3 and AP4 ES, Volume 5, Appendix EC-001-002 and Volume 5 map series EC-04.
- 2.1.2 The additional baseline data does not generate any new or different significant effects and therefore is not reported in Section 3.

Traffic and transport

- 2.1.3 Additional traffic surveys have been undertaken at junctions in the Colne Valley area to supplement the information reported in the main ES. The impacts of traffic associated with HS2 construction have been re-assessed in the context of this supplementary data. The new and different significant effects are reported in Section 3.
- 2.1.4 Details of the traffic survey data are included in SES3 and AP4 ES, Volume 5, Appendix TR-001-000.

2.2 Changes to the design or to construction assumptions not requiring a change to the Bill

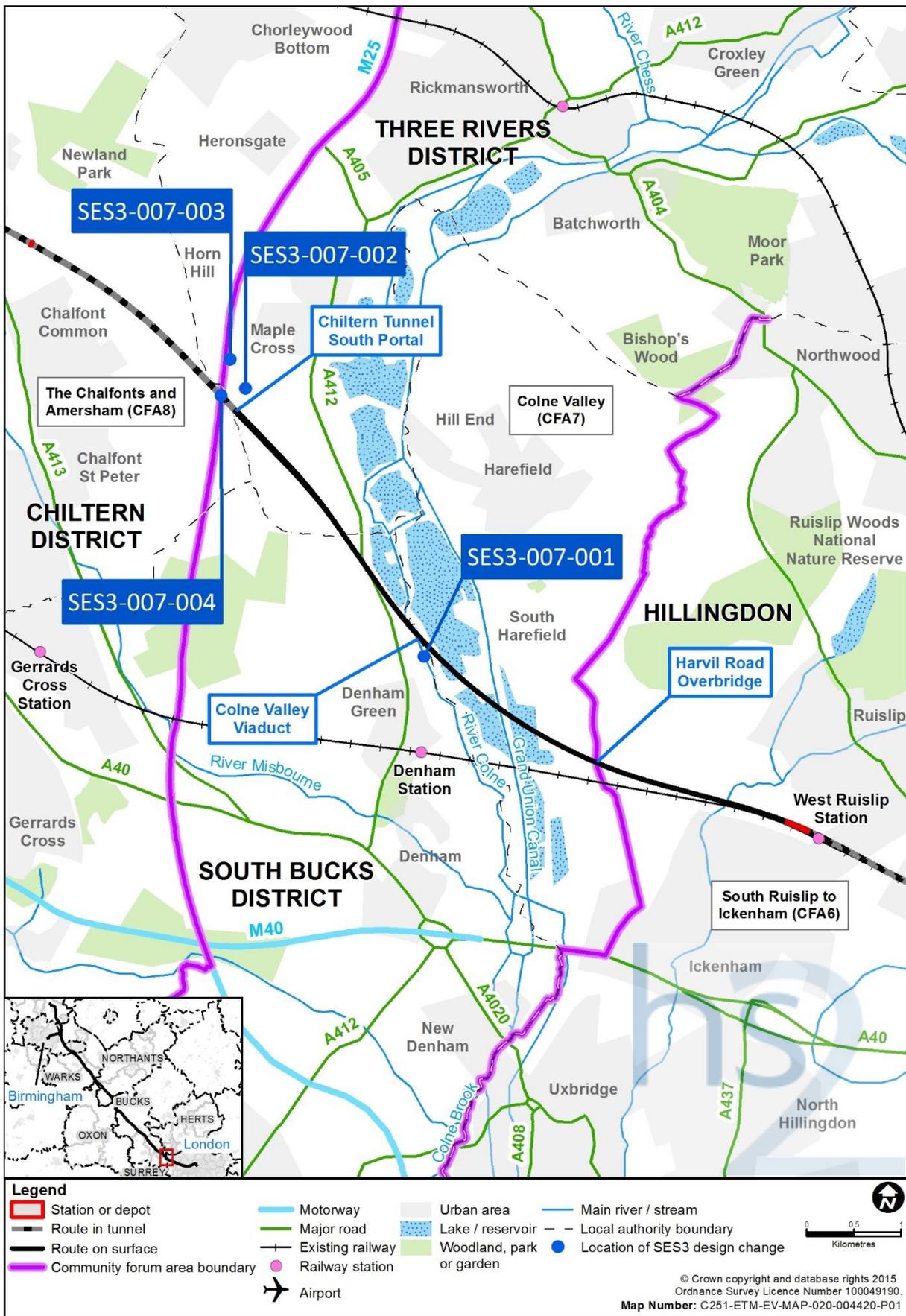
- 2.2.1 Table 2 provides a summary of the changes to the design or to construction assumptions not requiring a change to the Bill which will result in new or different significant effects in the Colne Valley community forum area (CFA7). Figure 1 shows the locations of the changes.

Table 2: Summary of changes to the design or construction assumptions not requiring a change to the Bill in CFA 7

Name of design change or construction assumption	Description of the SES scheme	Description of the SES3 scheme
Reconfiguration of land required at Battlesford Wood / Ranston Covert (SES3-007-001)	The requirement for land within Battlesford Wood / Ranston Covert, parts of which are ancient woodland, to construct the Colne Valley viaduct.	Further design development has resulted in a reduction in the land required for the construction of the Colne Valley viaduct. This is in order to reduce the ecological impact on Battlesford Wood / Ranston Covert, which includes areas of ancient woodland.
Utility works at Denham Quarry and Dews Farm (SES3-007-002)	Temporary realignment of 275kV overhead power lines over the Colne Valley, 80m to the west of its existing alignment, for a period of approximately three years and nine months, with permanent realignment of approximately 1km via the southern side of the Chiltern Main Line, across the Uxbridge Golf Course, over Harvil Road, northwards over the HS2 route and then back in a north-westerly direction to the National Grid feeder station north-east of the Hillingdon Outdoor Activity Centre (HOAC).	Further construction information has become available for the temporary realignment. The cables will be realigned to a temporary pylon west of their current alignment between the River Colne and Denham Quarry Lake B; and to a temporary pylon north-west of their current alignment to the north of the proposed National Grid feeder station. The permanent realignment is unchanged from that reported in the main ES.
Utility works at Chalfont Lane (SES3-007-003)	The temporary realignment of 132kV overhead power lines along the eastern side of the M25, with permanent realignment below ground along the existing alignment.	Further construction information has become available for the temporary realignment. The cables will be realigned via two temporary pylons east of the current alignment to the east of the M25. The permanent realignment will be as reported in the main ES.
Revised construction assumptions relating to the use of M25 slip roads (SES3-007-004)	<p>Heavy Goods Vehicle (HGV) construction traffic travelling to and from the Chiltern tunnel main compound/Chiltern tunnel south portal satellite compound and Colne Valley viaduct main compound would use the temporary dedicated M25 slip roads, between M25 junctions 16 and 17.</p> <p>HGV construction traffic generated by the remaining compounds within the Colne Valley area would use the A40 or M25 junction 17 and then the A412 to access and egress the compounds.</p>	<p>The routing of HGVs within the Colne Valley area has been revised. All HGV construction traffic generated by the following compounds will use the temporary dedicated M25 slip lanes between M25 junctions 16 and 17:</p> <ul style="list-style-type: none"> - Chiltern tunnel main compound/Chiltern tunnel south portal satellite compound; - Colne Valley viaduct main compound; - Colne Valley viaduct north embankment satellite compound; - Colne Valley viaduct north launch satellite compound; and - Colne Valley viaduct laydown satellite compound. <p>It is assumed that 50% of HGV traffic from the remaining two compounds in the Colne Valley area (Colne Valley viaduct jetty storage and Colne Valley viaduct storage satellite compounds) will use the temporary M25 slips (and</p>

Name of design change or construction assumption	Description of the SES scheme	Description of the SES ₃ scheme
		then Chalfont Lane, the A412 Denham Way and Moorfield/Moorhall Road). The remaining 50% will use the M40, A40, A412 Denham Way and Moorfield/Moorhall Road.

Figure 1: Locations of design changes not requiring a change to the Bill in CFA7



Description of changes to the design or to construction assumptions

Reconfiguration of land required at Battlesford Wood / Ranston Covert (SES₃-007-001)

- 2.2.2 The Bill provides for the temporary use of approximately 1ha of ancient woodland within Battlesford Wood / Ranston Covert to construct the Colne Valley viaduct (see map CT-05-020 in the main ES, Volume 2, CFA₇ Map Book).
- 2.2.3 Since submission of the Bill, an additional area of Ranston Covert and Battlesford Wood has been identified by Natural England as ancient woodland (see SES and AP₂ ES, Volume 2, CFA₇, Part 1). Further design development has resulted in a reduction in the land required for the construction of the Colne Valley viaduct by approximately 2.6ha, which has reduced the extent of ancient woodland loss by approximately 1.6ha (see map CT-05-020 in the SES₃ and AP₄ ES, Volume 2, CFA₇ Map Book).
- 2.2.4 The estimated duration of construction is the same as for the original scheme, outlined in the main ES.
- 2.2.5 The design change results in different significant effects for cultural heritage and ecology and these are reported in Section 3.

Utility works at Denham Quarry and Dews Farm (SES₃-007-002)

- 2.2.6 The Bill provides for the temporary realignment of 275kV overhead power lines over the Colne Valley, 80m to the west of its existing alignment, for a period of approximately three years and nine months, with permanent realignment of approximately 1km via the southern side of the Chiltern Main Line, across the Uxbridge Golf Course, over Harvil Road, northwards over the HS₂ route and then back in a north-westerly direction to the National Grid feeder station north-east of the Hillingdon Outdoor Activity Centre (HOAC) (refer to the main ES maps CT-05-019b, CT-05-019b-R1, CT-05-019b-L1, CT-06-019b, CT-06-019b-R1 and CT-06-019b-L1 in the Volume 2, CFA₇ Map Book). Part 2 of the SES and AP₂ ES also includes an amendment relating to additional land required for the revised permanent alignment of the diverted 275kV overhead cables (refer to AP₂-007-002 in the SES and AP₂ ES, Volume 2, Section 5.2).
- 2.2.7 Since submission of the Bill and the SES and AP₂ ES, further information has become available for the temporary realignment of the overhead cables. The cables will be realigned to:
- a temporary pylon approximately 65m west of the current cable alignment between the River Colne and Denham Quarry Lake B; and
 - a temporary pylon approximately 65m north-west of the current cable alignment, to the north of the proposed National Grid feeder station.
- 2.2.8 No additional land is required. The estimated duration of construction is the same as for the original scheme, outlined in the main ES. The pile depth for the temporary pylons is assumed to be up to 30m.
- 2.2.9 Excavators will be used to dig holes for the foundations and in certain ground conditions specialist piling rigs will be used. Pre-mixed concrete and steelwork will

then be delivered to site in wagons, for the foundation, frames and bases, and the pylons then delivered in sections. The pylons will be put up using a mobile crane which lifts the assembled steelwork into position. The works are expected to take approximately three months to complete. Topsoil will temporarily be stored adjacent to the working area and will be used to reinstate the area once construction is complete.

- 2.2.10 The additional information results in the identification of a new significant effect for water resources and flood risk assessment and this is reported in Section 3.

Utility works at Chalfont Lane (SES3-007-003)

- 2.2.11 The Bill provides for the temporary realignment of the 132kV overhead power line along the eastern side of the M25, with permanent realignment below ground along the existing alignment (see map CT-05-023a and CT-06-023a in main ES, Volume 2, CFA7 Map Book).

- 2.2.12 Since submission of the Bill, further information relating to the temporary realignment has become available. The cables will be realigned, via two temporary pylons, 60m east of the current alignment to the east of the M25.

- 2.2.13 Excavators will be used to dig holes for the foundations and in certain ground conditions specialist piling rigs will be used. Pre-mixed concrete and steelwork will then be delivered to site in wagons, for the foundation, frames and bases, and the pylons then delivered in sections. The pylons will be put up using a mobile crane which lifts the assembled steelwork into position. The works are expected to take approximately three months to complete. Topsoil will temporarily be stored adjacent to the working area and will be used to reinstate the area once construction is complete. The estimated duration of construction is the same as for the original scheme, outlined in the main ES. The pile depth for the temporary pylons is assumed to be up to 30m.

- 2.2.14 The additional information results in the identification of a new significant effect for water resources and flood risk assessment and this is reported in Section 3.

Revised construction assumptions relating to the use of M25 slip roads (SES3-007-004)

- 2.2.15 The Bill provided for temporary dedicated slip roads to and from the M25 between junctions 16 and 17. These would be used by heavy goods vehicle (HGV) construction traffic travelling to and from the Chiltern tunnel main compound/Chiltern tunnel south portal satellite compound and Colne Valley viaduct main compound (see map CT-05-022-R1 in main ES, Volume 2, CFA7 Map Book). HGV construction traffic generated by the remaining compounds within the Colne Valley area would use the A40 or M25 junction 17 and then the A412 to access and exit the compounds.

- 2.2.16 Since submission of the Bill, the proposed routing of HGVs within the Colne Valley area has been revised. All HGV construction traffic generated by the following compounds will use the temporary dedicated M25 slip lanes between M25 junctions 16 and 17:

- Chiltern tunnel main compound/Chiltern tunnel south portal satellite compound;
- Colne Valley viaduct main compound;
- Colne Valley viaduct north embankment satellite compound;
- Colne Valley viaduct north launch satellite compound; and
- Colne Valley viaduct laydown satellite compound.

2.2.17 It is assumed that 50% of HGV traffic from the remaining two compounds in the Colne Valley area (Colne Valley viaduct jetty storage and Colne valley viaduct storage satellite compounds) will use the temporary M25 slip roads (and then Chalfont Lane, the A412 Denham Way and Moorfield/Moorhall Road), with the remaining 50% using the M40, A40, A412 Denham Way and Moorfield/Moorhall Road. The estimated duration of construction is the same as for the original scheme, outlined in the main ES.

2.2.18 The additional information results in the identification of new and different significant effects for traffic and transport and these are reported in Section 3.

2.3 Topics included in the SES₃ assessment

2.3.1 The changes described above in Sections 2.1 to 2.2 result in new or different significant effects in respect of: cultural heritage; ecology; traffic and transport; and water resources and flood risk assessment.

3 Assessment of changes

3.1 Cultural heritage

Introduction

3.1.1 This section of the report describes the environmental baseline in relation to cultural heritage that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the changes introduced in Section 2, compared to those of the SES scheme.

3.1.2 Consideration is given to effects upon the value of heritage assets, including through changes to their setting, as a result of the additional changes.

Scope, assumptions and limitations

3.1.3 The assessment scope, key assumptions and limitations for cultural heritage are as set out in Volume 1, the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

SES₃ changes of relevance to this assessment

3.1.4 The change to land required during construction at Battlesford Wood / Ranston Covert (SES₃-007-001) is the only change considered in this assessment.

Environmental baseline

Existing baseline

3.1.5 The cultural heritage baseline for the assessment takes into account information collected for the main ES. This included walk-over survey, geophysical survey, remote-sensing data, and data from national and local registers. A full list of heritage assets is provided in Volume 2, Section 6.3 of the main ES. In addition, the baseline was updated in SES and AP₂ ES with the results of additional survey work.

3.1.6 A summary of the baseline information relevant to the assessment of new or different effects is provided below. For those assets described in the main ES, further details are provided in the baseline reports, gazetteer of heritage assets, impact assessment tables and survey reports in Volume 5 of the main ES and are shown on maps CH-01 (Heritage Assets within Study Area), CH-02 (Designated Heritage Assets) and CH-03 (Archaeological Character Sub-zones). Further details of the assets described in the SES and AP₂ ES can be found in Volume 2 of the SES and AP₂ ES. These assets are shown on map CH-01-023 in Volume 5, Cultural Heritage Map Book of the SES and AP₂ ES.

Designated assets

3.1.7 An additional area of ancient woodland within Ranston Covert and Battlesford Wood (asset reference¹ CVA045) has been added to the ancient woodland inventory by

¹ Asset references refer to the gazetteer of heritage assets in Volume 5 of the main ES.

Natural England since the main ES, as reported in the Part 1 of the SES and AP₂ ES. This asset is of high heritage value.

Non-designated assets

- 3.1.8 No new non-designated assets that are relevant to this assessment have been identified in the Colne Valley area.

Future baseline

Construction (2017)

- 3.1.9 Volume 5, Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments that are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 3.1.10 None of the identified developments affect the assessment of the SES₃ scheme's likely construction impacts on cultural heritage.

Operation (2026)

- 3.1.11 Volume 5, Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments that are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 3.1.12 None of the identified developments affect the assessment of the SES₃ scheme's likely operational impacts on cultural heritage.

Effects arising during construction

Avoidance and mitigation measures

- 3.1.13 Measures to avoid or mitigate significant effects on cultural heritage are provided in the draft CoCP (main ES, Volume 5, Appendix CT-003-000).

Assessment of impacts and effects

Permanent effects

- 3.1.14 The reduction in the amount of land required within Ranston Covert and Battlesford Wood (asset reference CVA045) due to the SES₃ design change results in the removal of approximately 0.1ha, 3.5% of the ancient woodland, due to the SES₃ scheme. This is compared to 1.7ha, 70% in the SES scheme. This reduces the impact on the heritage value of the ancient woodland from high to low, with a subsequent reduction in the effect from major adverse to moderate adverse, which remains significant.

Other mitigation measures

- 3.1.15 No additional mitigation measures (i.e. in addition to those identified in the main ES) are required.

Cumulative effects

- 3.1.16 There are no new or different likely significant cumulative effects for cultural heritage as a result of the SES3 changes acting in combination with one another, or as a result of any relevant committed development.

Summary of likely residual significant effects

- 3.1.17 The reduction in the amount of land required within Ranston Covert and Battlesford Wood (asset reference CVA045) results in the lowering of the residual effect for cultural heritage reported in the main ES and in the SES and AP2 ES from major to moderate. However, this remains a significant effect.

Effects arising from operation

- 3.1.18 The reduction in the amount of land required within Ranston Covert and Battlesford Wood will not give rise to a new or different significant effect on cultural heritage during operation and will not change the level of significance of the effects reported in the main ES and the SES and AP2 ES.

Volume 5 amendments

- 3.1.19 Table 3 sets out the additions to the main ES, Volume 5, Appendix CH-003-007.

Table 3: Additions to Volume 5, Appendix CH-003-007, Cultural Heritage – impact assessment tables

Unique identification	Name	Designation(s)	Value	Construction impact			Operation impact			New or different environmental effect from that reported in the main ES or the AP1 ES or SES and AP2 ES
				Nature of impact including mitigation	Scale of impact	Effect	Nature of impact including mitigation	Scale of impact	Effect	
CVA045	Ranston Covert and Battlesford Wood	Ancient Woodland	High	The woodland lies partially within the land required for the SES3 scheme. This will result in the loss of approximately 0.1ha or 3.5% of the ancient woodland.	Low adverse	Moderate adverse	The construction effect remains and there will be no further impact	No change	Neutral	The reduction in the amount of land required within the woodland means that the residual effect reported in the main ES and the SES and AP2 ES will be reduced from major to moderate, which remains significant.

3.2 Ecology

3.2.1 This section of the report describes the environmental baseline in relation to ecology that is relevant to the SES₃ assessment. It then identifies any new or different likely significant environmental effects as a result of the changes introduced in Section 2, compared to those of the SES scheme.

3.2.2 Consideration is given to the potential for impacts on species, habitats and sites designated on the basis of their importance for nature conservation.

Scope, assumptions and limitations

3.2.3 Updates to the scope of the assessment for ecology are as set out in Volume 1 of SES₃ and AP₄ ES. The key assumptions and limitations, and the methodology for determining significance of effects are as set out in Volume 1, the SMR and the SMR Addendum (Volume 5: Appendix CT-001-000/1 and CT-001-000/2) of the main ES and in Addendum 4 to the SMR (SES₃ and AP₄ ES Volume 5: Appendix CT-001-000/5).

3.2.4 To address any limitations in data, a precautionary baseline has been considered according to the guidance reported in the main ES, Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst-case' basis for the subsequent assessment. The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the SES₃ scheme.

SES₃ changes of relevance to this assessment

3.2.5 The only SES₃ change considered in this assessment is the change at Battlesford Wood / Ranston Covert in the Mid Colne Valley Site of Special Scientific Interest (SSSI) (SES₃-007-001).

Environmental baseline

Existing baseline

3.2.6 The ecological baseline for the assessment takes into account baseline information collected for the main ES, which included field survey data, aerial photography and relevant existing information gathered from national organisations and from regional and local sources. A full list of data sources that informed the main ES assessment in this area is provided in Volume 2, CFA7, Section 7.1 of the main ES. The assessment also takes into account additional desk study and survey information that is reported in Volume 5 of the SES and AP₂ ES.

3.2.7 Details of all amphibian surveys undertaken in this area during 2015 are provided in SES₃ and AP₄ ES, Volume 5: Appendix EC-001-002 and Volume 5 map series EC-04.

3.2.8 A summary of the baseline information relevant to the assessment is provided below.

Designated sites

3.2.9 The Mid Colne Valley SSSI is principally designated for woodland and chalk grassland habitat, and for a population of wintering waterfowl, as well as a diverse assemblage of breeding birds associated with woodland and wetland. The Mid Colne Valley SSSI is identified in the main ES as being of national value.

Habitats

- 3.2.10 Battlesford Wood/ Ranston Covert , part of which is ancient woodland, comprises the largest extent of woodland in the Mid Colne Valley SSSI and is of county/metropolitan value, as reported in the main ES. As reported in the SES and AP2 ES, updates to the ancient woodland inventory resulted in a decrease in the extent of ancient woodland at Battlesford Wood/ Ranston Covert to that reported in the main ES. However, the boundary of the ancient woodland within the larger area of woodland to the west of the River Colne also changed. Consequently, the extent of this ancient woodland habitat at Battlesford Wood/ Ranston Covert within the land required for the original scheme increased to 1.7ha, as reported in Part 1 of the SES and AP2 ES.
- 3.2.11 The main ES reported that the semi-natural broadleaved woodland along the western bank of the River Colne is wet woodland. This habitat is uncommon nationally, qualifies as a habitat of principal importance, and is of county/metropolitan value. Approximately 0.6ha of this woodland habitat is within land that is relevant to the assessment of the SES3 changes to the scheme at Battlesford Wood / Ranston Covert.
- 3.2.12 Other habitats present that are relevant to the assessment of the SES3 changes to the scheme at Battlesford Wood / Ranston Covert include approximately 0.3ha of poor semi-improved grassland and a pond of approximately 500m² in area. Neither of these habitats are of greater than local/parish value, as reported in the main ES.

Protected and/or notable species

- 3.2.13 There has been no change to the baseline information relating to protected and/or notable species as set out in Volume 2, CFA7 of the main ES and, where relevant, Part 1 of the SES and AP2 ES.

Future baseline

Construction (2017)

- 3.2.14 The future baseline for construction in 2017 remains unchanged from that reported in the main ES, Volume 2, CFA7, Section 7.3.

Operation (2026)

- 3.2.15 The future baseline for operation in 2026 remains unchanged from that reported in the main ES, Volume 2, CFA7, Section 7.3.

Effects arising during construction

Avoidance and mitigation measures

- 3.2.16 As reported in the main ES, the Colne Valley viaduct was designed to avoid the need for a long diversion of the River Colne and reduce the associated loss of river habitat and ancient woodland.
- 3.2.17 The assessment assumes implementation of the measures set out within the draft CoCP (Volume 5: Appendix CT-003-000 of the main ES), which includes translocation of protected species where appropriate.

Assessment of impacts and effects

Designated sites

- 3.2.18 The SES scheme would result in an adverse impact on the integrity of the Mid Colne Valley SSSI, significant at the national level.
- 3.2.19 The SES₃ design change will lead to a reduction in the land required for the construction of the Colne Valley viaduct by approximately 2.6ha. This will result in a reduction in land required within the Mid Colne Valley SSSI by approximately 2.3ha and will include a reduction in ancient woodland loss from the SSSI by approximately 1.6ha to 0.1ha. Therefore, the SES₃ change will result in a different significant effect on the integrity of the Mid Colne Valley SSSI. However, this will not change the level of significance of the effects reported in the main ES.

Habitats

- 3.2.20 The main ES reported that the loss of approximately 1ha of ancient woodland from Ranston Covert and Battlesford Wood would result in a permanent adverse effect on the conservation status of ancient woodland that would be significant at the county/metropolitan level. As reported in the SES and AP₂ ES, changes to the ancient woodland inventory mean that an additional 0.7ha of ancient woodland at Ranston Covert and Battlesford Wood is within the land required for construction of the SES scheme. The SES scheme resulted in a different permanent adverse effect on the conservation status of ancient woodland. However, the level of significance of the effects reported in the main ES remained significant at the county/metropolitan level.
- 3.2.21 The SES₃ design change reduces the loss of ancient woodland at Battlesford Wood / Ranston Covert by approximately 1.6ha to 0.1ha². Therefore, the SES₃ change will result in a different significant effect on the conservation status of ancient woodland. However, this will not change the level of significance of the effects reported in the main ES.
- 3.2.22 The main ES reports the loss of approximately 9 ha of semi-natural broadleaved woodland (not categorised as ancient woodland) from the Mid Colne Valley SSSI will result in permanent adverse effects on the conservation status of this habitat that will be significant at the county/metropolitan level. The SES₃ change to land required during construction at Battlesford Wood / Ranston Covert will lead to approximately 0.6ha of this woodland habitat being retained. Therefore, the SES₃ change will result in a different significant effect on the conservation status of semi-natural broadleaved woodland. However, this will not change the level of significance of the effects reported in the main ES.
- 3.2.23 It is unlikely that the SES₃ changes will result in any other new or different effects on habitat receptors of relevance at more than the local/parish level.

² The SES₃ change reduces the area of ancient woodland loss by 0.9ha in comparison with the main ES.

Protected and/or notable species

- 3.2.24 There are no proposed changes or new baseline data that will give rise to new or different significant effects on protected and/or notable species, or that will change the level of significance of the effects reported in the main ES or in Part 1 of the SES and AP₂ ES.

Cumulative effects

- 3.2.25 There are no new or different likely significant cumulative effects for ecology as a result of the SES₃ changes interacting with one another, the AP₁ amendments, AP₂ amendments, or any relevant committed development.

Other mitigation measures

- 3.2.26 Other mitigation measures in the main ES relevant to the assessment include the creation of 19.5ha of lowland mixed deciduous woodland in CFA7 to compensate for the loss of approximately 30ha of woodland, of which 24ha is semi-natural broadleaved woodland (including 1ha of ancient woodland) and 6ha of plantation broadleaved woodland. Ancient woodland is irreplaceable. However, the loss of woodland will be compensated through a range of measures, such as translocation of ancient woodland soil and seed bank that will increase connectivity of ancient woodlands within the Colne Valley.
- 3.2.27 Part 1 of the SES and AP₂ ES identified the requirement for additional compensation (i.e. beyond that provided in the main ES) due to a 0.7ha increase in the loss of ancient woodland. However, the SES₃ change will reduce the loss of ancient woodland at Battlesford Wood and Ranston Covert to 0.1ha. This is 0.9ha less than the 1ha of ancient woodland loss that was reported in the main ES, and was the basis for the compensation measures provided in the original scheme and described above.
- 3.2.28 The compensation measures identified in the main ES will continue to be provided. However, there is no longer a requirement to provide the additional compensation identified as being required in the SES and AP₂ ES as the loss of ancient woodland will now be less than that reported in the main ES.

Summary of likely residual significant effects

- 3.2.29 As a result of the SES₃ change there will be a reduction in the loss of ancient woodland at Ranston Covert and Battlesford Wood to approximately 0.1ha. This is a different significant effect. However, it remains a significant residual adverse effect at county/metropolitan level in relation to ancient woodland as it is considered to be an irreplaceable resource.

Effects arising from operation

- 3.2.30 The SES₃ change does not change the operation of the scheme and so there are no new or different significant operation effects for ecology as a result of the proposed SES₃ changes, compared with the main ES or SES.

3.3 Traffic and transport

Introduction

- 3.3.1 This section of the report provides a description of the environmental baseline in relation to traffic and transport that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the changes introduced in Section 2, compared to the SES scheme taking into account any relevant AP2 amendments.

Scope, assumptions and limitations

- 3.3.2 The assessment scope, key assumptions and limitations for traffic and transport are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

SES3 changes of relevance to this assessment

- 3.3.3 The revised construction assumptions relating to the use of M25 slip roads (SES3-007-004) is relevant to the assessment.
- 3.3.4 In addition, supplementary traffic data has been collected at the following highway junctions that are relevant to this assessment:
- A412 Denham Avenue/ Old Rectory Lane;
 - A412 Denham Avenue/ Moorfield Road; and
 - A412 Denham Way / Chalfont Road.
- 3.3.5 Details of the traffic survey data is included in SES3 and AP4 ES, Volume 5, Appendix TR-001-000.

Environmental baseline

Existing baseline

- 3.3.6 The existing baseline for traffic and transport is as set out in Volume 2, CFA7, Section 12 of the main ES, updated by the additional traffic survey data.

Future baseline

Construction

- 3.3.7 The future baseline for construction is as set out in Volume 2, CFA7, Section 12 of the main ES.

Operation (2026 and 2041)

- 3.3.8 The future baselines for operation are as set out in Volume 2, CFA7, Section 12 of the main ES.

Effects arising during construction

Avoidance and mitigation measures

- 3.3.9 No avoidance and mitigation measures additional to those reported in Volume 2, CFA7, Section 12 of the main ES are proposed.

Assessment of impacts and effects

Temporary effects

- 3.3.10 The changes to construction routes relating to the use of the dedicated M25 slip roads by HGV construction traffic and the revised baseline identified from the supplementary traffic data have the potential to change the assessed impacts of HS2 construction traffic on the local network in relation to congestion and delays and to traffic related severance for non-motorised users. The increased use of the M25 slip roads has substantial impacts on a number of local roads. However, in relation to use of the M25 slip roads it has less than a 10% increase in traffic flows at the peak period of construction.
- 3.3.11 The SES₃ scheme will result in new or different or the removal of likely residual significant effects in relation to congestion and delays to vehicle users at the following junctions:
- A₄₁₂ Denham Way/A₄₀₅ North Orbital Road/A₄₁₂ Uxbridge Road: the removal of the minor adverse significant effect reported in the main ES due to changes to construction routes;
 - A₄₁₂ North Orbital Road/Woodlands Road: the removal of the minor adverse significant effect reported in the main ES due to changes to construction routes;
 - A₄₁₂ North Orbital Road/Denham Green Lane: changes to construction routes results in a different significant effect – the level of significance will change from major adverse, as reported in the main ES, to moderate adverse;
 - A₄₁₂ Denham Way/Chalfont Lane: assessment of the supplementary traffic data and changes to construction routes results in the removal of the moderate adverse significant effect reported in the SES and AP₂ ES;
 - A₄₁₂ Denham Way/Chalfont Road: assessment of the supplementary traffic data and changes to construction routes results in the removal of the minor adverse significant effect reported in the main ES; and
 - A₄₁₂ Denham Avenue/Moorfield Road: assessment of the supplementary traffic data results in the identification of a new major adverse significant effect.
- 3.3.12 The assessment of the supplementary traffic data for A₄₁₂ Denham Avenue/Old Rectory Lane junction has not resulted in any new or different significant effects.
- 3.3.13 The changes to HGV construction routes will result in a new moderate adverse likely residual significant effect in relation to traffic related severance for non-motorised

users at A₄₁₂ Denham Way / North Orbital Road, between the satellite compounds and Chalfont Lane.

Permanent effects

- 3.3.14 The permanent effects of construction on traffic and transport are reported under 'Effects arising from operation'.

Other mitigation measures

- 3.3.15 No changes to the mitigation measures reported in Volume 2, CFA7 of the main ES are proposed.

Cumulative effects

- 3.3.16 The assessment has taken into account cumulative effects, including planned developments by taking account of background traffic growth, as well as traffic and transport impacts of works being undertaken in neighbouring areas.
- 3.3.17 There are no new or different likely significant cumulative effects for traffic and transport as a result of the SES₃ scheme interacting with AP₂ amendments.

Summary of likely residual significant effects

- 3.3.18 The SES₃ scheme assessment identifies a new major residual adverse significant effect at the A₄₁₂ Denham Avenue/Moorfield Road junction, in relation to congestion and delay to vehicle users. It also results in the removal of residual adverse significant effects at the A₄₁₂ Denham Way/Chalfont Road, A₄₁₂ Denham Way/A₄₀₅ North Orbital Road/A₄₁₂ Uxbridge Road and A₄₁₂ North Orbital Road/Woodlands Road junctions (all minor adverse) and at A₄₁₂ Denham Way/Chalfont Lane (moderate adverse). The SES₃ scheme also results in a moderate adverse residual significant effect in relation to congestion and delays at the A₄₁₂ North Orbital Road/Denham Green Lane junction – previously major adverse reported in the main ES.
- 3.3.19 In addition, the amended HGV flows due to changes to construction routes will result in a new moderate residual adverse significant effect on the A₄₁₂ Denham Way/North Orbital Road, between the satellite compounds and Chalfont Lane, in relation to traffic related severance for non-motorised users.
- 3.3.20 The significant effects that result from construction of the SES₃ scheme are shown on Map TR-03-051 in the SES₃ and AP₄ ES, Volume 5, Traffic and Transport, CFA7 Map Book.

Effects arising from operation

- 3.3.21 There are no changes in operation as a result of the SES₃ scheme and consequently there will be no new or different likely significant effects.

3.4 Water resources and flood risk assessment

Introduction

- 3.4.1 This section of the report provides a description of the environmental baseline in relation to water resources and flood risk that is relevant to the assessment. In

addition, it identifies any new or different likely significant environmental effects as a result of the changes described in Section 2 compared to the SES scheme.

Scope, assumptions and limitations

- 3.4.2 The assessment scope, key assumptions and limitations for water resources and flood risk assessment are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001 - 000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.
- 3.4.3 It is assumed that the temporary pylons in the SES₃ scheme will require piled foundations which penetrate the Chalk aquifer.

SES₃ changes of relevance to this assessment

- 3.4.4 Of the changes described in Section 2, those that have the potential to result in new or different likely significant effects on water resources and flood risk assessment are:
- utility works at Denham Quarry and Dews Farm (SES₃-007-002); and
 - utility works at Chalfont Lane (SES₃-007-003).

Environmental baseline

- 3.4.5 A summary of the baseline information relevant to the assessment of the SES₃ changes is provided below. For those receptors described in the main ES, further details are provided in the main ES Volume 2, CFA7, Section 13.3 and in Volume 5.
- 3.4.6 The utility works at Denham Quarry and Dews Farm (SES₃-007-002) and the utility works at Chalfont Lane (SES₃-007-003) are underlain by the Seaford Chalk Formation and the Newhaven Chalk Formation (undifferentiated). The Seaford Chalk Formation and the Newhaven Chalk Formation (undifferentiated) are classified as a Principal aquifer. For the temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm, these strata are overlain by superficial deposits comprising the Maidenhead Formation and Alluvium, that are classified as Secondary A aquifers. For the temporary realignment of the 132kV overhead electricity line across Chalfont Lane, the Chalk strata are overlain by superficial deposits comprising the Sudbury Formation, which is classified as a Secondary A aquifer.
- 3.4.7 The temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm is located within the Source Protection Zone (SPZ) 1 for public water supply (PWS) source TH177. The temporary realignment of the 132kV overhead electricity line across Chalfont Lane is located within the SPZ1 for PWS source TH171.
- 3.4.8 There are three licensed groundwater abstractions (GW₄₂, GW₃₆ and GW₃₇ as set out in Volume 5 of the main ES) within 1km of the temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm. There is one surface water abstraction (SW₃₈) within 1km of the temporary realignment of the 132kV overhead electricity line across Chalfont Lane. There are no recorded unlicensed abstractions (groundwater or surface water) within 1km of either of these design changes. However, there is the potential for unlicensed groundwater abstractions to exist, since a licence is not required for abstraction volumes of less than 20m³ per day.

Future baseline

Construction (2017)

- 3.4.9 The future baseline for construction in 2026 remains unchanged from the future baseline reported in the main ES.

Operation (2026)

- 3.4.10 The future baseline for operation in 2026 remains unchanged from that reported in the main ES.
- 3.4.11 Current projections to the 2080s indicate that climate change may affect the future baseline against which the impacts of the SES₃ scheme on groundwater resources have been assessed. However, these changes are not considered to result in the reported effects from the SES₃ scheme changing in significance.
- 3.4.12 Further information on the potential impacts of climate change for water resources and flood risk is provided in Volume 5: Appendix WR-003-012 of the main ES, and Sections 7 and 8 of Volume 1 and Table 13 of Volume 5: Appendix CT-009-000 of the main ES.

Effects arising during construction

Avoidance and mitigation measures

- 3.4.13 Measures to avoid or mitigate significant effects on water resources and flood risk are provided in the main ES, Volume 2, CFA7, Section 13.4 and in the draft CoCP (main ES, Volume 5: Appendix CT-003-000).
- 3.4.14 No avoidance or mitigation measures, additional to those reported in the main ES, are required.

Assessment of impacts and effects

Temporary effects

- 3.4.15 Following implementation of the mitigation measures including measures to control sediment mobilisation and the risk of spills, no additional significant adverse temporary effects on surface water features are expected as a result of the temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm and the temporary realignment of the 132kV overhead electricity line across Chalfont Lane.
- 3.4.16 Piling works could have an impact on groundwater quality due to the migration of fluids or suspended bedrock particles giving rise to raised turbidity. At the scale of the classified Mid Chilterns Chalk groundwater body, any turbid groundwater will be attenuated within the Chalk and diluted in regional flow. The overall impact on the groundwater body as a whole is deemed to be negligible, which for this high-value receptor would be a neutral effect and therefore not significant.
- 3.4.17 Migration of any turbid groundwater to surface water is likely to be a slow process, allowing natural attenuation within the Chalk and dilution, reducing turbidity to levels that are unlikely to significantly affect surface water quality. Therefore, the impact of

any change in groundwater quality in the wider groundwater body on surface water and water dependent habitats, which are of high value in this area, will be negligible, resulting in a neutral effect which is not significant.

- 3.4.18 During the construction phase, piling for foundations for the new pylons required for the temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm and the temporary realignment of the 132kV overhead electricity line across Chalfont Lane may have an impact on groundwater quality, since the piles will be up to 30m deep. If fissures connect the land required for the SES3 scheme directly to the Affinity Water groundwater abstractions that are protected by SPZ TH171 and TH177, the impact of low levels of turbidity will be major due to the high quality required to be met for potable use. The impact of this piling work is similar to that presented in the main ES due to construction of the Colne Valley Viaduct. However, the utilities diversion will result in new large and significant temporary adverse effects on PWS abstractions (TH171 and TH177) during the construction works since the diversions occur early in the construction programme (prior to the start of the rest of construction).

Permanent effects

- 3.4.19 The piled foundations for the new pylons required for the temporary realignment of the diverted 275kV overhead cables at Denham Quarry and Dews Farm and the temporary realignment of the 132kV overhead electricity line across Chalfont Lane are not expected to give rise to a new or different significant permanent effect on groundwater flows and levels due to their distance from large groundwater abstractions and their limited extent.
- 3.4.20 The utilities diversions will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or SES.

Other mitigation measures

- 3.4.21 The main ES (Volume 2, CFA7, Section 13.4) reported that, in respect of PWS, HS2 Ltd will agree a management strategy with the Environment Agency in consultation with Affinity Water that will cover timing of any physical mitigation, the scale and nature of monitoring and the thresholds at which actions are invoked (in terms of both quality and flow), the nature of other intervention measures and the responsibilities for ensuring agreed actions occur. Appropriate mitigation measures for significant effects associated with turbid groundwater reaching PWS abstractions include those being brought forward through an AP4 amendment (AP4-007-003). See Part 2, Section 5.2, for a full description of the measures proposed and the reporting of the new or different effects taking the proposed measures into account.

Cumulative effects

- 3.4.22 There are no new or different likely cumulative effects for water resources and flood risk assessment as a result of the SES3 changes interacting with one another, the AP1 and AP2 amendments or any relevant committed development.

Summary of likely residual significant effects

- 3.4.23 Until a management strategy is agreed with the Environment Agency in consultation with Affinity Water, there is the potential for residual significant effects associated with turbid groundwater reaching PWS abstractions. Amendment AP₄-007-003 (see Part 2, Section 5.2) will form part of the management strategy to remove these residual significant effects.

Effects arising from operation

- 3.4.24 The SES₃ changes do not change the operation of the scheme and so there are no new or different significant operation effects for water resources and flood risk assessment as a result of the proposed SES₃ changes, in comparison with the main ES.

Part 2: Additional Provision 4 Environmental Statement

4 Summary of amendments

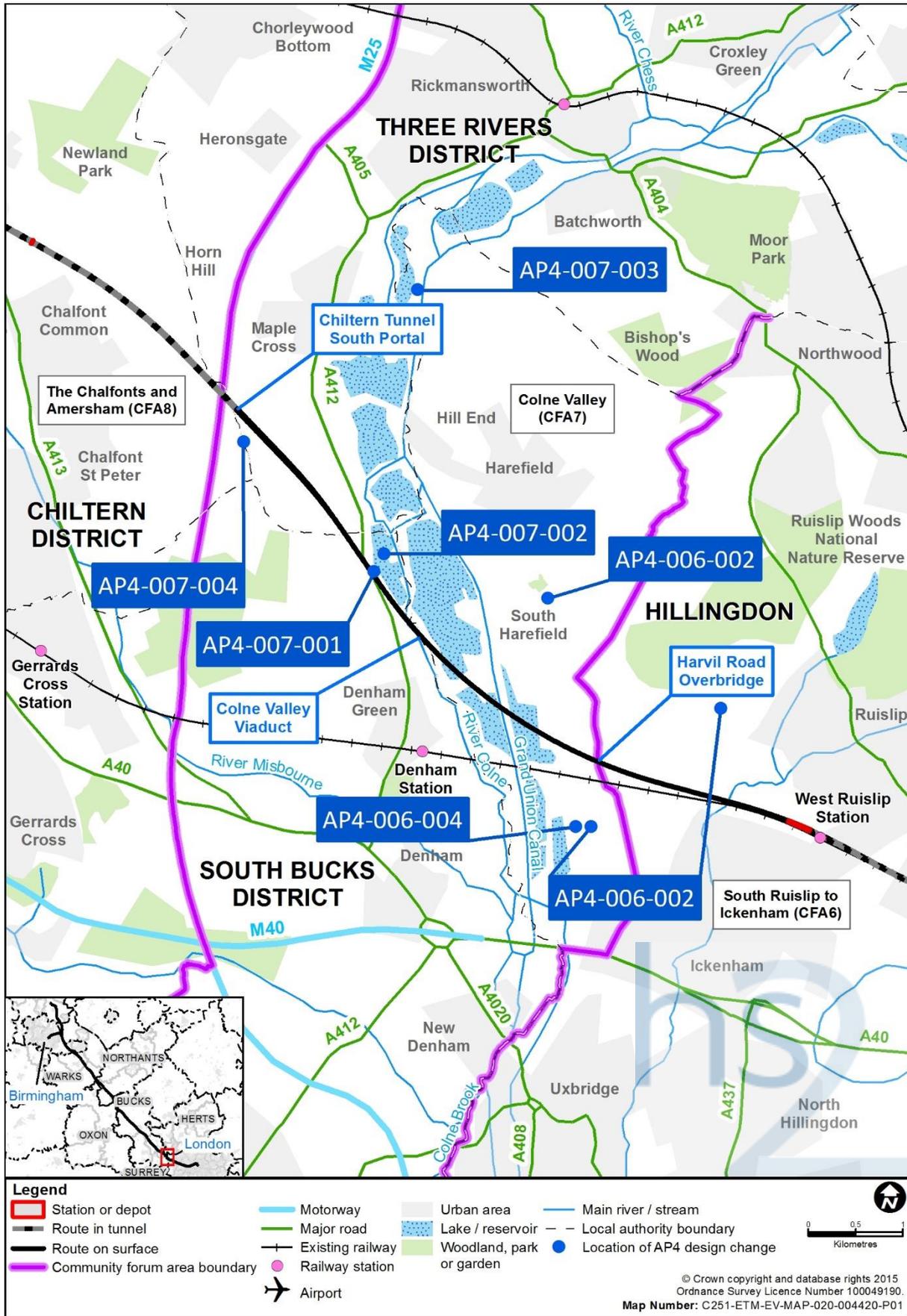
- 4.1.1 Table 4 provides a summary of the amendments in the Colne Valley community forum area (CFA7) and Figure 2 shows the locations.
- 4.1.2 The extension of the Chiltern tunnel from Mantle's Wood portal to South Heath green tunnel north portal (AP₄-009-001) will result in slight increases in traffic flows within CFA7. However, the peak traffic flows will be unchanged from those reported in the main ES and Part 1 of the SES and AP₂ ES. The amendment does not change the significant residual environmental effects or mitigation in CFA7 as set out in the SES₃ for any environmental topic.

Table 4: Summary of amendments in CFA7

Name of amendment	Description of the SES ₃ scheme or AP ₂ revised scheme	Description of the AP ₄ revised scheme
<p>Additional land required for the amended sustainable placement proposals in CFA6 and CFA7 and realignment of footpath U50</p> <p>(AP₄-006-002)</p>	<p>A sustainable placement area will be used to permanently deposit approximately 500,000m³ of surplus excavated materials from CFA6. The area, which will be approximately 850m long, up to 315m wide and up to 3m in height, will be located to the north of the original scheme, south-east of South Harefield. The sides of the sustainable placement area will be designed to tie into the existing landform. On completion, hedgerows will be replanted on their existing alignments and the land returned to agriculture.</p>	<p>The sustainable placement area at South Harefield will be removed. A new stockpile area will be included adjacent to Harvil Road. The site will be used temporarily to store topsoil. Transport of the topsoil will be via a haul route from the Cophall cutting to the north. A temporary crossing of Harvil Road is required. The land required for the stockpile area will be returned to agricultural use.</p> <p>Further changes to the sustainable placement strategy are proposed for CFA6 (see SES₃ and AP₄ ES, Volume 2, CFA6).</p> <p>Public Right of Way (PRoW) U50 will be temporarily diverted around the new stockpile area.</p>
<p>Additional land required for the provision of a haul road through Uxbridge Golf Course</p> <p>(AP₄-006-004)</p>	<p>The use of the A₄₀ Western Avenue, the B₄₆₇ Swakeleys Road and Harvil Road as a construction traffic route.</p>	<p>The temporary provision of a haul road through Uxbridge Golf Course to reduce the level of traffic on Swakeleys Road / Harvil Road. The haul road will connect, at its southern end, with the eastbound slip road adjacent to the A₄₀ Western Avenue / B₄₆₇ Swakeleys Road roundabout. It will connect at its northern end with Harvil Road. The haul road will pass through Uxbridge Golf Course, Fray's Farm Meadows SSSI, and land to the west of Harvil Road between two new temporary material stockpile areas (see AP₄-006-002). The haul road will be constructed from the south using a new compound within CFA7: the Uxbridge Golf Course haul road satellite compound. It will be constructed from the north using the Northolt tunnel and earthworks main compound. The construction traffic route via the A₄₀ Western Avenue, the B₄₆₇ Swakeleys Road and Harvil Road will be retained but will be subject to lower construction traffic flows than those reported in Part 1 of the SES and AP₂ ES.</p>
<p>Additional land required for access to Denham Water Ski Club</p> <p>(AP₄-007-001)</p>	<p>The temporary provision of an access road to enable entrance and exit to the Water Ski Club during the construction of the Colne Valley viaduct. Construction would require land to the north-east of the A₄₁₂ Denham Way/North Orbital Road, of which the Denham Water Ski Club is accessed. A small amount of land that forms part of the car park for the club would be required to provide a jetty to construct the Colne Valley viaduct.</p> <p>The reduction/modification of proposed permanent provision of landscape mitigation planting on an area of land that members of the club currently use for recreation.</p>	<p>The temporary provision of a haul road closer to the Colne Valley viaduct. This will enable crossing controls to be installed during construction and for the club's access road to remain open.</p> <p>An alternative temporary access road to the club's facilities will also be provided. The alternative access road will link with an existing access road used by a utility provider. Additional land is required permanently for the alternative access as during operation it will be used by HS2 for access to a balancing pond.</p> <p>The amendment also includes the installation of a grass reinforcement mesh in a section of grassland adjacent to the club house, to enable cars to park in the area.</p> <p>The permanent provision of landscape mitigation planting on an area of land that members of the club currently use for recreation will be removed.</p>

Name of amendment	Description of the SES3 scheme or AP2 revised scheme	Description of the AP4 revised scheme
		A balancing pond to the south of the club house will be replaced by a drainage ditch.
Additional land required for track drainage discharge in the Colne Valley (AP4-007-002)	An existing buried culvert, assumed to be to the south of Waybeards Cottages approximately on the alignment of an Affinity Water access track, would be used to convey track drainage from the Colne Valley viaduct to the River Colne.	Additional land is required permanently along the length of the existing culvert to allow the culvert and the existing outfalls to be modified or upgraded as necessary following more detailed site investigation.
Additional land required for the temporary provision of turbidity treatment equipment in the Colne Valley (AP4-007-003)	The temporary provision of potential mitigation options to treat water abstractions affected by turbidity as a consequence of tunnelling and piling impacts on groundwater resources.	<p>The temporary provision of turbidity treatment equipment at the following existing pumping stations: Mill End, Springwell Lake and West Hyde. The equipment will be located within the curtilage of the existing utility provider's land. The equipment will connect with existing abstraction and discharge points present within the existing pumping station facilities.</p> <p>Additional areas of the utility provider's land is required temporarily to accommodate the equipment. The temporary treatment equipment will be installed on existing hardstanding and there will be no change to the existing site drainage.</p>
Provision of a cantering route between Bridleways CSP/44 and Rickmansworth 004 (AP4-007-004)	The permanent provision of an overbridge up to approximately 1m above the existing ground level, providing a realignment of Tilehouse Lane and Bridleway Rickmansworth 004 over the route. The diversion of the bridleway via the Tilehouse Lane overbridge would result in a loss of a straight length of bridleway that is used by equestrians for cantering.	The permanent provision of a new section of bridleway parallel to, and south of, the route of the scheme between the realigned bridleways CSP/44 and Rickmansworth 004. The bridleway will be approximately 700m long and will be straight to enable cantering.

Figure 2: Locations of amendments in CFA7



5 Assessment of amendments

5.1 Additional land required for the amended sustainable placement proposals in CFA₆ and CFA₇ and realignment of footpath U₅₀ (AP₄-006-002)

- 5.1.1 The Bill provides for the permanent provision of a sustainable placement area within CFA₇ to permanently deposit approximately 500,000m³ of surplus excavated materials from CFA₆. The area, which would be approximately 850m long, up to 315m wide and up to 3m in height, would be located to the north of the route, south-east of South Harefield (see maps CT-05-019b-R1, CT-05-019b-R2, CT-06-019b-R1 and CT-06-019b-R2 in main ES, Volume 2, CFA₇ Map Book). The sides of the sustainable placement area would be designed to integrate with the existing landform. On completion, hedgerows would be replanted on their existing alignments and the land returned to agriculture.
- 5.1.2 Since submission of the Bill, further refinement to the sustainable placement strategy in the area has resulted in the removal of the sustainable placement area at South Harefield. The site in the original scheme on the former New Years Green Lane landfill is designated a special site due its effect on important groundwater sources and is therefore not appropriate for use for sustainable placement. New sustainable placement areas will be provided in CFA₆ as part of this amendment to deposit permanently the 500,000m³ of material (see SES₃ and AP₄ ES, Volume 2, CFA₆).
- 5.1.3 In addition, two new temporary material stockpile areas will be included, both of which will be to the west of Harvil Road and east of Uxbridge Golf Course in CFA₇. The northern area will be approximately 200m long and 100m wide. The southern area will be approximately 300m long and 180m wide. The new sites will be used temporarily to store topsoil. A total of up to 250,000m³ of topsoil will be stored up to 3m above existing ground level. The topsoil will be stored for approximately four and a half years. Transport of the topsoil will be via a new haul route (within CFA₆) from the Copthall cutting to the north. A temporary crossing of Harvil Road is required. PRoW U₅₀ will be temporarily diverted around the southern stockpile area. The land required for the new stockpile areas will be returned to agricultural use. The northern extent of the proposed haul route through Uxbridge Golf Course (AP₄-006-004) will be located between the two stockpile areas (see Section 5.2 and maps CT-05-019b, CT-05-019b-R1, CT-05-019b-L1, CT-05-019b-R2, CT-06-019b-R1 and CT-06-019b-R2 in the SES₃ and AP₄ ES, Volume 2, CFA₇ Map Book).
- 5.1.4 Further changes to sustainable placement as part of this amendment are proposed for CFA₆ (see SES₃ and AP₄ ES, Volume 2, CFA₆).
- 5.1.5 The amended sustainable placement proposals in CFA₇ and realignment of footpath U₅₀ are not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: air quality; land quality; socio-economics; and water resources and flood risk assessment. However, there were changes where reassessment was considered to be required in respect of: agriculture, forestry and soils; community; cultural heritage;

ecology; landscape and visual assessment; sound, noise and vibration; and traffic and transport.

Agriculture, forestry and soils

Introduction

- 5.1.6 This section of the report describes the environmental baseline in relation to agriculture, forestry and soils that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.1.7 The assessment scope, key assumptions and limitations for agriculture, forestry and soils are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.1.8 Two agricultural holdings will be affected by the AP₄ amendment in this CFA:
- Harvil Farm (main ES reference CFA06/5), which is an arable and grassland holding of approximately 16ha; and
 - Park Lodge Farm (CFA07/1), which is a 240ha dairy farm.

Future baseline

Construction (2017)

- 5.1.9 Volume 5, Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments that are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.10 None of the identified developments affect the assessment of the AP₄ revised amendments on agriculture, forestry and soils.
- 5.1.11 Most existing environmental stewardship agreements will expire in 2015 and will be replaced by a new environmental land management scheme (countryside stewardship) which, together with the new greening measures introduced by Common Agricultural Policy reform, will affect the detailed management of individual farm holdings. These are not expected to change fundamentally the baseline circumstances described.

Operation (2026)

- 5.1.12 Volume 5, Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments that are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.13 None of the identified developments affect the assessment of the AP₄ revised amendments likely operational impacts on agriculture, forestry and soils.

Effects arising during construction

- 5.1.14 Although the area of agricultural land affected by the new stockpile area is relatively large (15.1ha) none of the land affected is classified as best and most versatile (BMV). The amendment will therefore not result in a new or different significant effect and will not change the level of significance of the effects reported in the main ES in terms of the loss of BMV agricultural land within the CFA. The route-wide effects on BMV land and forestry land are reported in SES3 and AP4 ES, Volume 3.
- 5.1.15 The main ES (Volume 2, CFA6) reported that 7.1ha of land, all within CFA6, was required temporarily from Harvil Farm for construction of the original scheme. This represented 44% of the holding and was assessed as a major/moderate effect, which is significant. The additional area of land that will be required temporarily from Harvil Farm for the new stockpile area is approximately 7.8ha and is within CFA7. The total area of land required temporarily is therefore 14.9ha, which effectively represents all of the land farmed by this holding. The amendment will result in a different significant effect to that reported in the main ES, but will not change the level of significance (major/moderate adverse).
- 5.1.16 The main ES (Volume 2, CFA7) reported that 66.3ha of agricultural land was required temporarily from Park Lodge Farm for construction of the original scheme. This represented 28% of the holding and was assessed as a major adverse effect, which is significant. The sustainable placement area included in the original scheme at South Harefield, which is removed by the amendment, included approximately 8.0ha of useable agricultural land. The amendment in CFA6 involves a change to the sustainable placement areas to the north of New Years Green Lane and between Breakspear Road South and Harvil Road. The area of agricultural land required temporarily from Park Lodge Farm in CFA6 and CFA7 will be reduced to approximately 61.4ha. The permanent area of land required from the holding will reduce from 43.8ha to 33.1ha. The amendment will not give rise to a new or different significant effect on the holding and will not change the level of significance of the effects reported in the main ES.

Effects arising from operation

- 5.1.17 The amended sustainable placement proposals in CFA7 and realignment of footpath U50 will not give rise to a new or different significant effect during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.1.18 No mitigation measures are proposed for this amendment. The amendment will result in no change in the likely residual significant effects reported in the main ES.

Cumulative effects

- 5.1.19 There are no new or different likely significant cumulative effects for agriculture, forestry and soils as a result of the amendment acting in combination with another amendment in AP4, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Community

Introduction

- 5.1.20 This section of the report describes the environmental baseline in relation to community that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.1.21 The assessment scope, key assumptions and limitations for community are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.1.22 The baseline community information for CFA₇, Colne Valley is described in the main ES (Volume 2, CFA₇ Report, Section 5).

Future baseline

Construction (2017)

- 5.1.23 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.24 None of the identified developments affect the assessment of the AP₄ amendment's likely construction impacts on community.

Operation (2026)

- 5.1.25 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.26 None of the identified developments affect the assessment of the AP₄ amendment's likely operational impacts on community.

Effects arising during construction

- 5.1.27 The new material stockpile areas do not require land that is used by community resources or residential property. The additional land requirements will not give rise to any new or different significant construction effects and will therefore not change the level of significance of the effects reported in the main ES.

Effects arising from operation

- 5.1.28 No significant operation effects were reported in the main ES with regard to the sustainable placement of surplus excavated materials.

- 5.1.29 The additional land requirements for the amended sustainable placement will not give rise to any new or different significant effects on community during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.1.30 No avoidance and mitigation measures additional to those reported in the main ES are required.
- 5.1.31 There are no new or different significant residual effects on community that occur as a consequence of the amendment. The significant residual effects of the AP₄ revised scheme in this area are therefore unchanged from those reported in the main ES.

Cumulative effects

- 5.1.32 There are no new or different likely significant cumulative effects for community as a result of the amendment acting in combination with another amendment in AP₄, or as a result of any relevant committed development interacting with the AP₄ revised scheme.

Cultural heritage

Introduction

- 5.1.33 This section of the report describes the environmental baseline in relation to cultural heritage that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.1.34 The assessment scope, key assumptions and limitations for cultural heritage are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001 -000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.1.35 The cultural heritage baseline for the assessment takes into account information collected for the main ES, which included walk-over survey, geophysical survey, remote-sensing data, and data from national and local registers. A full list is provided in Volume 2, Section 6.3 of the main ES and updated in Volume 2, section 3.2 of the SES and AP₂ ES.
- 5.1.36 The land required for the amendment includes two non-designated heritage assets:
- the Thames Terrace Deposits (asset reference CVA₀₄₄); and
 - the Roman road from Verulamium (St Albans) to Laleham (asset reference CVA₁₁₁), which was not included in the assessment reported in the main ES or SES and AP₂ ES.
- 5.1.37 The Thames Terrace deposits (asset reference CVA₀₄₄) are of moderate heritage value due to their location adjacent to the river, where prehistoric and later settlement is more likely, and their geological formation, which has the potential to contain archaeological deposits. There is other evidence of prehistoric activity 380m to the

north-west, with Mesolithic archaeology at Dews Farm (asset reference CVA021), a heritage asset of moderate value. Before they were removed by aggregate extraction there was also evidence of a ring ditch (asset reference CVA010) 1km to the north-west of the land required and a Mesolithic lithic working site (asset reference CVA029) 1.5km to the north-west. These sites are no longer considered to have heritage value due to their removal.

- 5.1.38 The exact route of the Roman road from Verulamium (St Albans) to Laleham (asset reference CVA111) is not certain, but it is projected to run through the land required for the new stockpile area. The full length of the road ran from Verulamium (St Albans) to Laleham; the section within the land required for the amendment is approximately 380m of this route. The asset is of low heritage value.
- 5.1.39 The land required for the new stockpile areas adjoins the former parkland of Harefield Place (asset reference CVA112) on its western boundary, now used as Uxbridge Golf Course. The former parkland includes a Grade II listed building, Harefield Place, and Pinnock Wood, an ancient woodland. The best surviving remnants of the parkland, including Pinnock Wood, are clustered around Harefield Place 300m to the south-west of the land required for the amendment. The former parkland (asset reference CVA112) is an asset of moderate heritage value.

Future baseline

Construction (2017)

- 5.1.40 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.41 None of the identified developments affect the assessment of the AP₄ amendment's likely construction impacts on cultural heritage.

Operation (2026)

- 5.1.42 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.1.43 None of the identified developments affect the assessment of the AP₄ amendment's likely operational impacts on cultural heritage.

Effects arising during construction

- 5.1.44 The relocation of the sustainable placement will result in further groundwork within the Thames Terrace deposits (asset reference CVA044) and a Roman road (asset reference CVA111). This will result in an increased potential for the removal of any archaeology associated with the assets.
- 5.1.45 In the main ES, the moderate impact of the original scheme on the Thames Terrace deposits, an asset of moderate heritage value, resulted in a significant moderate adverse effect. Although an additional 8.3ha is to be removed, when compared with

the extent that will be removed by the original scheme, and the extremely large scale of the heritage asset, this additional amount is not considered to result in a different effect to that reported in the main ES.

- 5.1.46 The land required for the amendment is located at the north-western edge of the former parkland of Harefield Place (asset reference CVA112) but does extend into the asset itself. The north-western area of the asset has been heavily altered through the development of the golf course. The majority of the key historic features are clustered around Harefield Place itself, 300m to the south-west. Harefield Place will remain unaffected by the proposal due to screening provided by modern development and the existing parkland planting. The land will be returned to agriculture following its use for stockpile areas, restoring the setting of the asset. The amended sustainable placement and realignment of footpath U50 will slightly alter our ability to understand and appreciate the historic context and setting of the asset resulting in a temporary low impact on the value of asset. This will result in a minor adverse effect, which is not significant.
- 5.1.47 Given the overall extent of the assumed route of the Roman road (asset reference CVA111), the approximately 380m to be removed by the land required for the sustainable placement will not significantly alter the ability to understand and appreciate the heritage asset. The amendment will result in a low adverse impact on the heritage asset and a minor adverse effect, which is not significant.
- 5.1.48 The amended sustainable placement proposals in CFA7 and realignment of footpath U50 will not give rise to a new or different significant effect on cultural heritage during construction and will not change the level of significance of the effects reported in the main ES and in SES3 in Part 1 of this CFA report.

Effects arising from operation

- 5.1.49 The permanent construction effects will remain and there will be no further impact.
- 5.1.50 The amended sustainable placement proposals in CFA7 and realignment of footpath U50 will not give rise to a new or different significant effect on cultural heritage during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.1.51 There will be no change to the mitigation and residual effects reported in Volume 2 of the main ES.

Cumulative effects

- 5.1.52 There are no new or different likely significant cumulative effects for cultural heritage as a result of the amendment acting in combination with another amendment in AP4, or in AP1 and AP2, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Volume 5 amendments

- 5.1.53 Table 5 sets out the additions to the main ES, Volume 5, Appendix CH-002-007. Table 6 sets out the additions to the main ES, Volume 5, Appendix CH-003-007.

Table 5: Additions to Volume 5, Appendix CH-002-007, Cultural Heritage – gazetteer of heritage assets

Unique ID	Map references	Asset type	Name	Description	Period	Designation	Grade	Significance/ value	NHL ³ reference	HER ⁴ reference
CVA111	CH-01-023 CH-01-023-L1	Arch-aeology	Roman road from Verulamium (St Albans) to Laleham	A Roman road (Viatores 165) is believed to have been established between settlements at Verulamium and Laleham. The exact route of this road is not known but believed to run approximately along the line of the eastern boundary of the study area.	Roman	Non designated	N/A	Low	N/A	1325686
CVA112	CH-01-023 CH-01-023-L1	Historic Landscape	Harefield Place and former parkland	<p>Harefield Place, which was built in 1786 as Harefield Lodge by Henry Couchman for Sir Roger Newdigate of Harefield, to replace the old manor house near Harefield Church of St Mary. Built in brick of two storeys and attic with eight central bays and two end pavilions. It was turned into a hospital in 1934 with associated alterations including a large crescent extension to the north.</p> <p>The former parkland has been much altered by the introduction of typical linear golf course layout although some standard oaks remain. Remnants of the historic landscaping remain around the house including the approach from The Drive, the south lawn, terracing, a walled garden and stables.</p> <p>Pinnock Wood ancient and semi natural woodland appears to have been incorporated into the parkland. Its value also lies in its potential for well-preserved archaeological remains of woodland management and industries typical of woodland such as wood banks, saw pits, quarries and small settlements. They can also preserve features of earlier periods.</p>	Post medieval	Listed building Ancient Woodland	Grade II	Moderate	1080238	104475

³ National Heritage List

⁴ Historic Environment Record

Table 6: Additions to Volume 5, Appendix CH-003-014, Cultural Heritage – impact assessment tables

Unique identification	Name	Designation(s)	Value	Construction impact			Operation impact			New or different environmental effect from that reported in the main ES, AP1 ES or the SES and AP2 ES.
				Nature of impact including mitigation	Scale of impact	Effect	Nature of impact including mitigation	Scale of impact	Effect	
CVA111	Roman road from Verulamium (St Albans) to Laleham	Non designated	Low	Approximately 380m of the overall assumed route will be removed. Given the extent of the route this removal of this length of the Roman road will slightly affect the ability to understand and appreciate the significance of the asset.	Low adverse	Minor adverse	There will be no further impact from the operation of the scheme.	No change	Neutral	No new or different significant environmental effects have been identified.
CVA112	Harefield Place and former parkland	Grade II listed building Ancient woodland	Moderate	The land required for the scheme adjoins the area of the former parkland that has already been heavily altered by the golf course development. The more majority of the extant assets, around Harefield Place, lie 300m to the south-west and is screened by modern development and parkland planting.	Temporary low adverse	Temporary minor adverse	There will be no further impact from the operation of the scheme.	No change	Neutral	No new or different significant environment effects have been identified.

Ecology

Introduction

- 5.1.54 This section of the report describes the environmental baseline in relation to ecology that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme and taking into account any amendments from previous AP ES reports that are relevant to the assessment. This includes the AP₂ amendment for additional land required for the revised alignment of the diverted 275kV overhead cables (AP₂-007-002).

Scope, assumptions and limitations

- 5.1.55 Updates to the scope of the assessment for ecology are set out in Volume 1 of SES₃ and AP₄ ES. The key assumptions and limitations, and the methodology for determining significance of effects are as set out in Volume 1, the SMR and the SMR Addendum (Volume 5: Appendix CT-001-000/1 and CT-001-000/2) of the main ES and in Addendum 4 to the SMR (SES₃ and AP₄ ES Volume 5: Appendix CT-001-000/5).
- 5.1.56 To address any limitations in data, a precautionary baseline has been considered according to the guidance reported in the main ES, Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst-case' basis for the subsequent assessment. The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the AP₄ revised scheme.

Existing baseline

- 5.1.57 The ecological baseline of the land required for the amendment has been based on field data collated for the main ES, aerial photography and relevant existing information gathered from national organisations and from regional and local sources including: Greenspace Information for Greater London.
- 5.1.58 A summary of the baseline information relevant to the assessment of the amendment is provided below. This takes account of any relevant 2015 survey information provided in SES₃ and AP₄ ES, Volume 5, Appendix EC-001-002. For those receptors described in the main ES, further details are provided in Volume 2, CFA7, Section 7.3 of the main ES and in Volume 5, including maps EC-01 to EC-12 of the main ES.

Designated sites

- 5.1.59 There are two statutory designated sites for nature conservation relevant to the assessment of the amendment:
- Fray's Farm Meadows SSSI (26.3ha) is approximately 350m west of the land required for the amendment. It is designated for species-rich grassland, wetland plants and invertebrates and is of national value, as reported in the main ES; and
 - Fray's Valley Local Nature Reserve (LNR) (71.8ha) is approximately 350m west of the land required for the amendment. It is designated for woodland, grassland, scrub and wetland habitats and is of district/borough value, as

reported in the main ES. The majority of the Fray's Farm Meadows SSSI lies within the LNR.

5.1.60 There are four non-statutory designated sites for nature conservation relevant to the assessment of the amendment, comprising one Site of Metropolitan Importance (SMI) and three Sites of Borough Importance grade 1 or grade 2 (SBI.I or SBI.II) for nature conservation. The SMI is of county/metropolitan value and the SBI are each of district/borough value, as reported in the main ES:

- Mid Colne Valley SMI (321ha) is approximately 350m west of the land required for the amendment. It is designated for riparian habitat with a diverse assemblage of aquatic and wetland plants, species-rich grassland and wet woodland. It is also designated for breeding and wintering water birds, invertebrates, water voles and harvest mice;
- New Years Green SBI.I (18.7ha) is approximately 400m north of the land required for the amendment. It is designated for broadleaved woodland, which is dominated by pedunculate oak, ash and hornbeam. The site also supports the locally notable buckthorn and musk thistle;
- Harefield Hall and The Lodge SBI.II (11.2ha) is adjacent to the land required for the amendment. It is designated for broadleaved woodland; and
- Brackenbury Railway Cutting SBI.II (4.9ha) is approximately 115m north of the land required for the amendment. It is designated for broadleaved woodland, which is dominated by pedunculate oak, elder and English elm.

5.1.61 Pinnock Wood, an area of broadleaved ancient semi-natural woodland is approximately 200m west of the land required for the amendment.

5.1.62 Statutory and non-statutory designated sites for nature conservation within the wider study area are described in the main ES, Volume 2, CFA6 and CFA7, Section 7 and are shown on EC-01-011 to EC-01-013a, Volume 5, Ecology Map Book.

Habitats

5.1.63 The main ES reports that hedgerows to the west of Harvil Road and east of South Harefield may qualify as important hedgerows under the Hedgerows Regulations 1997⁵ and most are likely to qualify as a habitat of principal importance. However, given their limited extent, and as they do not form a continuous network, these hedgerows are considered to be of local/parish value. Approximately 1.5km of additional hedgerow habitat is present within or adjacent to land required for the new temporary material stockpile areas at Harvil Farm, and approximately 1.7km of hedgerow habitat is present within or adjacent to land that is no longer required for the sustainable placement area at South Harefield for the original scheme. These hedgerows form part of the network west of Harvil Road and east of South Harefield, and are therefore of local/parish value as reported in the main ES.

⁵ The Hedgerows Regulations 1997 (1997 No. 1160). London, Her Majesty's Stationery Office.

- 5.1.64 The main ES reports that ponds that have not been accessed are considered to be of up to local/parish value. This includes four ponds within the land that was required for the sustainable placement area at South Harefield for the original scheme.
- 5.1.65 The majority of the land required for the sustainable placement area at South Harefield for the original scheme comprises approximately 24ha of poor semi-improved grassland. The main ES reports that this type of grassland is common in the surrounding landscape and is of local/parish value.
- 5.1.66 The majority of the land required for the new material stockpile areas at Harvil Farm comprises approximately 7.5ha of agricultural land, consisting of improved grassland with scattered broadleaved trees, and a small area of scrub, approximately 0.1ha in extent. None of these habitats are of greater than local/parish value, as reported in the main ES.
- 5.1.67 Habitats surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3 and are shown on Maps EC-02-021b to EC-02-025a, Volume 5, Ecology Map Book.

Protected and/or notable species

- 5.1.68 The main ES identified a population of great crested newts of up to county/metropolitan value potentially present in the vicinity of Uxbridge Golf Course. The new material stockpile areas at Harvil Farm contains hedgerow and grassland habitat that is suitable as terrestrial habitat for this species. It is approximately 150m from the nearest water body likely to be used for breeding by the assumed metapopulation.
- 5.1.69 The main ES reported that the four ponds and surrounding grassland east of South Harefield may support a population of great crested newt that is of up to county/metropolitan value.
- 5.1.70 Populations of reptiles potentially present in the grassland and scrub around Uxbridge Golf Course are reported in the main ES as being of up to county/metropolitan value. Hedgerow, grassland and scrub present within the amendment area is continuous with that present around Uxbridge Golf Course, and is therefore likely to form part of the habitat used by the assumed population of reptiles in this area.
- 5.1.71 The main ES reported that a diverse assemblage and high abundance of bat species assumed to be using the wider landscape for foraging and commuting around Harvil Road, is of up to county/metropolitan value. The new material stockpile areas at Harvil Farm contain hedgerows and scattered trees that provide suitable habitats for bats, and may be utilised by this assemblage.
- 5.1.72 Badger populations that are recorded utilising land required for the construction of the original scheme are of local/parish value, as reported in the main ES. Given the presence of suitable habitat within land required for the new material stockpile areas at Harvil Farm, this area may also support badgers.
- 5.1.73 Species identified within the area surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3. Locations of species records are shown on Maps EC-04 to EC-12, Volume 5, Ecology Map Book.

Future baseline

Construction (2017)

- 5.1.74 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.1.75 None of the identified developments affect the assessment of the amendment's likely construction impacts on ecology.

Operation (2026)

- 5.1.76 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.1.77 None of the identified developments affect the assessment of the amendment's likely operational impacts on ecology.

Effects arising during construction

Avoidance and mitigation measures

- 5.1.78 The assessment assumes implementation of the measures set out within the draft CoCP (Volume 5: Appendix CT-003-000 of the main ES), which includes translocation of protected species where appropriate.

Designated sites

- 5.1.79 The amendment will not give rise to new or different significant effects on designated sites and will not change the level of significance of the effects reported in the main ES.

Habitats

- 5.1.80 The main ES reports that the loss of approximately 1.7km of hedgerow habitat, 24ha of semi-improved grassland and standing water to the west of the Harvil Road and east of South Harefield as a result of the original scheme is unlikely to result in adverse effects on each of these habitats at more than the local/parish level. The amendment will result in the retention of these habitats, but will result in the loss of approximately 1.5km of hedgerow habitat at Harvill Farm, 7.5ha of improved grassland with scattered broadleaved trees, and a small area of scrub. This will result in local/parish level effects on each of the habitat types concerned, which are not significant.
- 5.1.81 It is unlikely that the amendment will result in any new or different effects on habitat receptors of relevance at more than the local/parish level. Local/parish level effects which are in addition to those identified in the main ES and the SES and AP2 ES are listed in Volume 5: Appendix EC-003-002 of the SES3 and AP4 ES.

Protected and/or notable species

- 5.1.82 The main ES reports that construction of the original scheme would remove habitat suitable for great crested newt in the vicinity of Uxbridge Golf Course. This will result in a permanent adverse effect on the conservation status of the great crested newt population in this area that would be significant at up to the county/metropolitan level.
- 5.1.83 The new material stockpile areas at Harvil Farm are approximately 150m from the nearest water body likely to be used for breeding by the assumed great crested newt metapopulation. The amendment will not result in the loss of breeding habitat. However, it will lead to the loss of terrestrial habitat, including approximately 250m of hedgerow and 0.5ha of improved grassland within 250m of the nearest potential great crested newt breeding water body. Due to the distance of the amendment from the breeding water body and the abundance of suitable terrestrial habitat surrounding the water body, it is not expected that the temporary loss of hedgerow and improved grassland as a result of the amendment will generate any new or different significant effects on the conservation status of great crested newt in this area, or change the level of significance of the effects reported in the main ES.
- 5.1.84 The main ES reports that the sustainable placement area will remove four ponds and surrounding grassland east of South Harefield, the loss of which could result in a permanent adverse effect on the conservation status of the great crested newt population in this area that would be significant at up to the county/metropolitan level. The sustainable placement area at South Harefield will be removed as part of the amendment. As such, the ponds and surrounding grassland east of South Harefield will be retained and there will no longer be an adverse effect on the conservation status of the great crested newt population in this area. The significant effect on this population reported in the main ES will not occur.
- 5.1.85 The main ES reports that grassland and scrub within the vicinity of Uxbridge Golf Course will be removed, which would result in a permanent adverse effect on the conservation status of reptiles that is significant at up to the county/metropolitan level. An additional 1.5km of hedgerow, 7.5ha of improved grassland and 500m² of scrub within the new material stockpile areas at Harvil Farm, which is continuous with that present around Uxbridge Golf Course, will be lost as a result of the amendment. As such, the amendment will result in a different significant effect on the conservation status of reptiles in this area. However, this will not change the level of significance of the effects reported in the main ES.
- 5.1.86 The main ES reports that no significant effects are expected on the diverse assemblage and high abundance of bat species assumed to be using the wider landscape for foraging and commuting around Harvil Road as a result of the original scheme. The new material stockpile areas at Harvil Farm will involve the removal of mature trees which were not accessible for survey. On a precautionary basis, the removal of these trees could lead to the loss of bat roosts. The loss of roosts could give rise to a new significant effect on the conservation status of the bat assemblage at Harvill Road that would be significant at up to the county/metropolitan level.
- 5.1.87 The amendment will not result in any other new or different effects on protected and/or notable species receptors of relevance at more than the local/parish level.

Local/parish level effects which are in addition to those identified in the main ES and the SES and AP2 ES are listed in Volume 5: Appendix EC-003-002 of the SES3 and AP4 ES.

Cumulative effects

- 5.1.88 Part 2 of the SES and AP2 ES reports that the amendment would provide additional land required for the revised alignment of the diverted 275kV overhead cables (AP2-007-002) will result in the removal of an additional 0.5ha of grassland, parts of which may be suitable reptile habitat. The land required for construction of the haul road through Uxbridge Golf Course (AP4-006-004) will result in the loss of an additional 1.3ha of scrub and 4.5ha of grassland. The combined loss of habitat suitable for reptiles resulting from the additional land required for the amended sustainable placement proposals (AP4-006-002), the revised alignment of the diverted 275kV overhead cables (AP2-007-002) and the additional land required for the provision of a haul road through Uxbridge Golf Course (AP4-006-004) totals approximately 14ha, including 1.5km of hedgerow. This would lead to a different significant effect on the conservation status of reptiles, but the effect would remain significant at the county/metropolitan level as reported in the main ES.
- 5.1.89 Part 2 of the SES and AP2 ES reports that amendments AP2-007-002 and AP2-007-003 would result in the removal of an additional 0.8ha of grassland and 0.5ha of woodland that forms terrestrial habitat for the great crested newt population in the vicinity of Uxbridge Golf Course. The land required for the construction of the haul road through Uxbridge Golf Course (AP4-006-004) will not result in the loss of great crested newt breeding habitat. However, it will lead to the loss of terrestrial habitat, including approximately 200m of hedgerow, 0.2ha of scrub and 0.3ha of semi-improved grassland habitat within 250m of the nearest water body assumed to be used for breeding. The combined loss of terrestrial habitat suitable for great crested newt resulting from the additional land required for the amended sustainable placement proposals (AP4-006-002), AP2-007-002, AP2-007-003 and AP4-006-004 will be 1.6ha of the grassland, 450m of hedgerow, 0.2ha of scrub and 0.5ha of woodland. This will lead to a different significant effect on the conservation status of the great crested newt population at Uxbridge Golf Course, but the effect will remain significant at the county/metropolitan level. It is not considered that there are any other new or different likely significant cumulative effects for ecology as a result of the AP4 amendments interacting with the AP1 amendments, AP2 amendments or any relevant committed development.

Mitigation and residual effects

Other mitigation measures

- 5.1.90 The main ES reports that compensatory habitat to address the impacts of the scheme on the great crested newt population at Uxbridge Golf Course and other populations in the wider local area will be provided in wet grassland created near the National Grid feeder station area and woodland planting near Harvil Road. In addition, the habitats within the land required for the amendment will be reinstated post-construction. As such, no additional mitigation measures (i.e. in addition to those identified in the main ES), nor a reduction in mitigation provision for great crested newts are required.

- 5.1.91 Compensatory habitat to address the impacts of the scheme on the possible reptile population at Uxbridge Golf Course and other populations in the wider local area will be provided in wet grassland created near the National Grid feeder station area and the woodland creation area near Tilehouse Lane, as reported in the main ES. The habitats used by reptiles within the land required for the amendment will be reinstated post-construction. As such, no additional mitigation measures nor a reduction in mitigation provision for reptiles are required.
- 5.1.92 The main ES reports that although no significant impacts on the bat species or assemblages are expected in CFA₇, there are a number of compensatory measures that will address any effects. These measures will include the creation of new bat roosting habitat in the land required for construction of the scheme as set out in the ecological principles of mitigation (Volume 5: Appendix CT-001-000/2). As such, the potential loss of bat roosts as a result of the new material stockpile areas at Harvil Farm will be addressed through provision of additional new bat roost opportunities within the existing limits of the Bill. These measures will reduce adverse effects on bats arising from activities associated with the new material stockpile areas at Harvil Farm to a level where they are not significant.

Summary of likely residual significant effects

- 5.1.93 No new or different significant residual effects on ecological receptors will occur, following implementation of the mitigation measures, as a consequence of the amendment.

Effects arising from operation

- 5.1.94 The temporary sustainable placement area at Harvil Farm does not change the operation of the scheme and so there are no new or different significant operation effects for ecology as a result of the amendment, in comparison with the main ES.

Landscape and visual assessment

Introduction

- 5.1.95 This section of the report describes the environmental baseline in relation to landscape and visual that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.1.96 The assessment scope, key assumptions and limitations for the landscape and visual assessment are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES. Updates to the methodology for the landscape and visual assessment are also described in Volume 1 of the AP₁ ES and Volume 1 of the SES and AP₂ ES.

Existing baseline

- 5.1.97 A summary of the baseline information in the main ES relevant to the assessment of the AP₄ revised scheme is provided below. Further details are provided in the main ES Volume 2, CFA₇, Section 9. Maps are provided in main ES, Volume 5, Landscape report LV-001-007.

- 5.1.98 The area of land required for the amendment is located within the Harefield Farmland Valley LCA as described in the main ES (Volume 2, CFA7, Section 9). This is a predominantly agricultural area with pasture and arable farmland and areas of woodland, including Newyears Green Covert and Cophall Covert. The existing Chiltern Main Line overhead power lines and other infrastructure detract from the overall quality of the area. The landscape is in fair condition, tranquillity is medium and the LCA is located within green belt. This area has a high sensitivity to change.
- 5.1.99 Viewpoints located close to the land required for the amendment and which are described in the main ES (Volume 2, CFA7, Section 9) are:
- Viewpoint 049.2.002: View north from Harvil Road, Ickenham;
 - Viewpoint 049.6.003: View west from Railway bridge on Harvil Road;
 - Viewpoint 049.3.005: View west from PRoW (Footpath U50);
 - Viewpoint 052.2.004: View south-west from Harvil Road, Ickenham;
 - Viewpoint 054.2.005: View east from Harvil Road, South Harefield;
 - Viewpoint 054.3.006: View north-east from PRoW (Footpath U31) near South Harefield; and
 - Viewpoint 054.3.007: View north-west from PRoW (Footpath U31) near South Harefield.

Future baseline

Construction (2017)

- 5.1.100 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES, and the SES and AP2 ES.
- 5.1.101 None of the identified developments affect the assessment of the amendment's likely construction impacts on the landscape and visual assessment.

Operation (2026)

- 5.1.102 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.1.103 None of the identified developments affect the assessment of the amendment's likely operational impacts on the landscape and visual assessment.

Effects arising during construction

Landscape assessment

- 5.1.104 The Harefield Farmland Valley LCA was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to the construction of the Colne

Valley viaduct, the presence of satellite compounds, the use of land east of Harvil Road for segment casting and sustainable placement, demolition of buildings, vegetation removal and an increase in traffic movements.

- 5.1.105 The removal of the sustainable placement area at South Harefield will reduce the scale of construction taking place north of Harvil Road. However, there will be additional construction activities associated with the temporary stockpile areas on land west of Harvil Road. The overall scale of the works will be similar to the original scheme. Consequently the amended sustainable placement proposals within the context of the overall construction activity within this LCA will give rise to a different significant effect. However, this amendment will not change the level of significance of the effects reported in the main ES.

Visual assessment

- 5.1.106 Viewpoint 049.3.005: View west from PRoW (Footpath U50) was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to vegetation removal within the Uxbridge Golf Course allowing open views of construction activity in the middle ground and beyond across the Chiltern Main Line.
- 5.1.107 The use of land west of Harvill Road for stockpile areas will increase the number of incongruous and highly visible features in the view. For Viewpoint 049.3.005: View west from PRoW (Footpath U50), there will be further views of construction activity including earthworks and construction machinery in the foreground of the view. The amendment will give rise to a different significant effect. However, this will not change the level of significance of the effects reported in the main ES or SES and AP2 ES.
- 5.1.108 Viewpoint 049.2.002: View north from Harvil Road, Ickenham was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to open and direct views of the topsoil storage area, offices and welfare buildings, segment fabrication, sustainable placement areas and the treatment plant for excavated material east of Harvil Road but oblique and filtered views of activities to the west of Harvil Road.
- 5.1.109 The use of land west of Harvill Road for stockpile areas will increase further views of construction activity including earthworks and construction machinery. However, seen in the context of the large scale sustainable placement works of the original scheme, it will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or SES and AP2 ES.
- 5.1.110 Viewpoint 049.6.003: View west from railway bridge on Harvil Road, representative of Uxbridge Skip Hire was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a moderate adverse significant effect during construction due the construction of the Colne Valley viaduct (approximately 200m from the viewpoint) and satellite compound.
- 5.1.111 The use of land west of Harvill Road as a stockpile area will be visible in oblique views and largely filtered. In the context of the large scale construction works of the original

scheme, it will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or SES and AP2 ES.

- 5.1.112 Viewpoint 052.2.004: View south-west from Harvil Road, Ickenham was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to views of the construction activity on the National Grid feeder station, the removal of an electricity pylon and filtered views of the construction of the Colne Valley viaduct, the satellite compound and the construction access route.
- 5.1.113 The removal of the sustainable placement area at South Harefield will remove close views of construction that would have been highly visible which would have resulted in incongruous features in the view. However, the remaining parts of the scheme will remain visible in longer views. The amendment will give rise to a different significant effect and this will reduce the level of significance of the effects reported in the main ES from major to moderate adverse.
- 5.1.114 Viewpoint 054.2.005: View east from Harvil Road, South Harefield was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a moderate adverse significant effect during construction due to views of the construction activity associated with the sustainable placement area.
- 5.1.115 The significant effect reported in the main ES will no longer occur, since there will be no sustainable placement area at South Harefield.
- 5.1.116 Viewpoint 054.3.006: View north-east from PRoW (Footpath U31) near South Harefield and Viewpoint 054.3.007: View north- west from PRoW (Footpath U31) near South Harefield were assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to views of the construction activity associated with the sustainable placement area in the foreground of the view.
- 5.1.117 The significant effect reported in the main ES will no longer occur, since there will be no sustainable placement area at South Harefield.

Effects arising from operation

Landscape assessment

- 5.1.118 The Harefield Farmland Valley LCA was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during year one of operation, reducing to moderate adverse significant by year 15 when mitigation planting will have partly integrated the scheme into the landscape. By year 60, effects will be further reduced to negligible, which is non-significant. The effects reported are due to the presence of the Colne Valley viaduct, overhead line equipment and trains and the Ickenham auto-transformer and National Grid feeder stations in the landscape, introducing prominent built elements into the LCA which alter its character.
- 5.1.119 The removal of the sustainable placement area at South Harefield will remove an element of the scheme that would have been a prominent new feature in the LCA. However, the change is relatively small in the context of the elements that remain

part of the AP4 revised scheme. Consequently the amendment will not generate a new or different significant effect and will not change the level of significance of the effect reported in the main ES.

Visual assessment

- 5.1.120 Viewpoint 049.2.002: View north from Harvil Road, Ickenham, Viewpoint 049.3.005: View west from PRow (Footpath U50) and Viewpoint 049.6.003: View west from Railway bridge on Harvil Road will not be affected by the amendment in operation since the temporary stockpile area west of Harvil Road will be returned to agricultural use at the end of construction.
- 5.1.121 The amendment will not generate a new or different significant effect and will not change the level of significance of the effect in the main ES.
- 5.1.122 Viewpoint 052.2.004: View south-west from Harvil Road, Ickenham was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during winter of year one of operation, reducing to moderate adverse significant during summer of year one because of the filtering effect of intervening vegetation. By years 15 and 60, effects will be reduced to minor adverse, which is non-significant due to the greater effectiveness of screen planting in filtering views. The effects reported are due to the views of the National Grid feeder station, the feeder station access road and the diverted pylon route.
- 5.1.123 The removal of the sustainable placement area at South Harefield will remove a prominent element of the scheme. However, the view of the National Grid feeder station, the feeder station access road and the diverted pylon route will remain unchanged. Therefore the amendment will not generate a new or different significant effect and will not change the level of significance of the effect reported in the main ES.
- 5.1.124 Viewpoint 054.3.006: View north-east from PRow (Footpath U31) near South Harefield and Viewpoint 054.3.007: View north-west from PRow (Footpath U31) near South Harefield were assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a moderate adverse significant effect during winter of year one of operation, reducing to minor adverse, which is non-significant in summer of year one when the land is restored to agricultural use. By years 15 and 60, effects will be reduced to negligible, which is non-significant when reinstated hedgerows have restored the existing field pattern. The effects reported are due to the close views of the sustainable placement area.
- 5.1.125 The significant effect reported in the main ES will no longer occur, since there will be no sustainable placement area at South Harefield.
- 5.1.126 Viewpoint 054.2.005: View east from Harvil Road, South Harefield was assessed as being non-significantly affected during operation in the main ES.
- 5.1.127 The removal of the sustainable placement area will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.1.128 No additional mitigation measures are required.
- 5.1.129 The removal of the sustainable placement area at South Harefield will reduce the scale of construction taking place north of Harvil Road. However, the use of land west of Harvil Road for a temporary stockpile will move the effect south-east in the Harefield Farmland Valley LCA. Consequently the amendment will result in a different significant effect but will not change the level of significance of the effect reported in the main ES (major adverse).
- 5.1.130 The amendment will change the significance of the effects reported in the main ES from major adverse significant to moderate adverse significant on Viewpoint 052.2.004: View south-west from Harvil Road, Ickenham during construction.
- 5.1.131 Significant effects on the following viewpoints during construction will now no longer occur as a result of the amendment:
- Viewpoint 054.2.005: View east from Harvil Road, South Harefield (moderate adverse); and
 - Viewpoint 054.3.006: View north-east from PRoW (Footpath U31) near South Harefield (major adverse).
- 5.1.132 The amendment will give rise to a different significant effect, during construction, on viewpoint 049.3.005: View west from PRoW (Footpath U50). However, this will not change the level of significance of the effects reported in the main ES or SES and AP2 ES (major adverse).

Cumulative effects

- 5.1.133 There are no new or different likely significant cumulative effects for landscape as a result of the AP4 amendments interacting with one another, the AP1 amendments, AP2 amendments, or any relevant committed development.

Sound, noise and vibration

Introduction

- 5.1.134 This section of the report describes the environmental baseline in relation to sound, noise and vibration that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those reported in the main ES.

Scope, assumptions and limitations

- 5.1.135 The assessment scope, key assumptions and limitations for sound, noise and vibration are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.
- 5.1.136 Local assumptions and limitations for sound, noise and vibration are set out in main ES Volume 2, CFA7, Section 11.

Existing baseline

- 5.1.137 The baseline sound, noise and vibration information for CFA7, Colne Valley is described in the main ES (Volume 2, CFA7 Report, Section 11). Baseline sound levels representative of the assessment locations affected by this amendment have been used in the construction sound, noise and vibration assessments.

Future baseline

- 5.1.138 Construction
- 5.1.139 The future baseline for construction in 2017, and construction traffic in 2021, remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Operation (2026)

- 5.1.140 The future baseline for operation in 2026 remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Effects arising during construction

- 5.1.141 The closest noise-sensitive receptors to the new material stockpile areas are the residential properties on Harvil Road located to the south and east of the land required for the AP4 amendment (represented by assessment locations 408881 and 406098, see main ES, Volume 5, Sound, noise and vibration map book – Euston and London Metropolitan, SV-03 maps), and the Uxbridge Golf Course club house, located to the south of the amendment (represented by assessment location 406180). In the main ES, no likely significant effects from construction noise were identified at these receptors.
- 5.1.142 Within CFA7, the AP4 amendment will involve additional works related to the two new stockpile areas to the west of Harvil Road and west of the areas identified in the main ES.
- 5.1.143 An assessment has been undertaken to determine whether construction noise and vibration associated with the amendment will result in a likely significant effect, using the significance criteria detailed in the main ES (Volume 5: Appendix SV-001-000).
- 5.1.144 The works associated with the amendment are not predicted to lead to a substantial change in noise levels at the sensitive receptors from those reported in the main ES and consequently the amendment will not give rise to a new or different significant effect compared with those reported in the main ES.

Effects arising during operation

- 5.1.145 As the amendment is during the construction phase only, the amendment will not give rise to a new or different significant operational noise or vibration effect compared with those reported in the main ES.

Mitigation and residual effects

- 5.1.146 The assessment of construction noise and vibration assumes the implementation of the principles and management processes set out in the draft CoCP (main ES Volume 5: Appendix CT-003-000).

- 5.1.147 No additional mitigation is considered necessary as a result of the AP4 amendment.
- 5.1.148 There is no change to the residual significant construction noise effects identified in the main ES as a result of this amendment.

Cumulative effects

- 5.1.149 This assessment has considered the potential cumulative construction noise effects of the scheme and other committed developments.
- 5.1.150 There are no new or different likely significant cumulative effects for sound, noise and vibration as a result of the amendment acting in combination with another amendment in AP4, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Traffic and transport

Introduction

- 5.1.151 This section of the report provides a description of the environmental baseline in relation to traffic and transport that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to the SES3 scheme taking into account any relevant AP2 amendments.
- 5.1.152 The B467 Swakeleys Road and Harvil Road form the boundary between the South Ruslip to Ickenham area (CFA6) and CFA7. The traffic and transport effects upon these roads are solely reported in Volume 2, CFA6 of the SES3 and AP4 ES.

Scope, assumptions and limitations

- 5.1.153 The assessment scope, key assumptions and limitations for the traffic and transport assessment are as set out Volume 1, the SMR (Appendix CT-001 -000/1) and the SMR Addendum (Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.1.154 The baseline traffic and transport information for Colne Valley is as described in the main ES (Volume 2, CFA7) and the SES and AP2 ES.

Future baseline

Construction

- 5.1.155 The future baseline for construction is as described in the main ES, Volume 2, CFA7, Section 12 and the SES and AP2 ES.

Operation (2026 and 2041)

- 5.1.156 The future baselines for operation are as described in the main ES, Volume 2, CFA7, Section 12 and the SES and AP2 ES.

Effects arising during construction

- 5.1.157 There will be a temporary diversion of Footpath U50 around the new stockpile areas, adding 350m to the length of the footpath. This will give rise to a moderate adverse effect on non-motorised users due to increased travel distance. This is a new

significant effect, as shown on map TR-03-051 in SES3 and AP4 ES, Volume 5, CFA7 Traffic and Transport Map Book.

Effects arising from operation

- 5.1.158 The diversion of Footpath U50 is temporary and will not give rise to new or different significant effects on traffic and transport during operation and will not change the level of significance of the effects reported in the main ES and SES.

Mitigation and residual effects

- 5.1.159 No changes to mitigation measures reported in Volume 2, CFA8, Section 12 of the main ES are proposed.
- 5.1.160 A new residual significant effect on non-motorised users of Footpath U50 due to increased travel distance will arise from the temporary diversion of Footpath U50.
- 5.1.161 The significant effects that result from the amended sustainable placement proposals in CFA7 and realignment of Footpath U50 are shown on map TR-03-051 in SES3 and AP4, ES Volume 5: Traffic and Transport Map Book.

Cumulative effects

- 5.1.162 The moderate significant adverse effect for users of Footpath U50 due to the temporary diversion will combine with the minor adverse significant traffic severance effect from the provision of a haul road through Uxbridge Golf Course (AP4-006-004) that crosses the footpath. This will result in a new temporary cumulative effect.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.1.163 The removal of the sustainable placement area at South Harefield will reduce the scale of construction taking place north of Harvil Road. However, the use of land west of Harvil Road for a temporary stockpile will move the effect south-east in the Harefield Farmland Valley LCA. Consequently, the amendment will result in a different significant residual effect on the Harefield Farmland Valley LCA but will not change the level of significance of the residual effect reported in the main ES (major adverse).
- 5.1.164 The amendment will change the significance of the residual effects reported in the main ES from major adverse significant to moderate adverse significant on Viewpoint 052.2.004: View south-west from Harvil Road, Ickenham during construction.
- 5.1.165 Significant residual effects on the following viewpoints during construction will now no longer occur as a result of the amendment:
- Viewpoint 054.2.005: View east from Harvil Road, South Harefield (moderate adverse); and
 - Viewpoint 054.3.006: View north-east from PRoW (Footpath U31) near South Harefield (major adverse).
- 5.1.166 The AP4 amendment will give rise to a different significant residual effect, during construction, on viewpoint 049.3.005: View west from PRoW (Footpath U50).

However, this will not change the level of significance of the residual effects reported in the main ES or SES and AP2 ES (major adverse).

5.1.167 A new residual significant effect on non-motorised users of Footpath U50 due to increased travel distance will arise from the amended sustainable placement proposals in CFA7 and realignment of Footpath U50.

5.1.168 The AP4 amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any other topic. The effects of the amendment that occur in CFA6 are reported in SES3 and AP4 ES, Volume 2, CFA6.

5.2 Additional land required for the provision of a haul road through Uxbridge Golf Course (AP4-006-004)

5.2.1 The Bill provides for the A40 Western Avenue, the B467 Swakeleys Road and Harvil Road to be used as a construction traffic route (see maps CT-05-019a, CT-05-019a-L1, and CT-05-019a-L2 in main ES, Volume 2, CFA6 Map Book).

5.2.2 Since submission of the Bill, a requirement for the temporary provision of a haul road through Uxbridge Golf Course has been identified to reduce the level of traffic on Swakeleys Road / Harvil Road (which form the boundary between the South Ruslip to Ickenham area (CFA6) and CFA7). The haul road will connect at its southern end with the eastbound slip road adjacent to the A40 Western Avenue / B467 Swakeleys Road roundabout. The southern section of the haul road will pass to the west of, and parallel to, The Drive and through Fray's Farm Meadows SSSI for approximately 250m. The northern section will pass through Uxbridge Golf Course and land to the west of Harvil Road between two new temporary material stockpile areas (see AP4-006-002). The haul road will require embankments within sections of the route. The haul road will connect at its northern end with Harvil Road. New signal-controlled junctions will be provided temporarily at both ends of the haul road, with part-signalisation of the roundabout between the A40 and Swakeleys Road.

5.2.3 It will be constructed from the south using a new compound within CFA7: the Uxbridge Golf Course haul road satellite compound. The haul road will be constructed from the north using the Northolt tunnel and earthworks main compound (described in the main ES).

5.2.4 The new Uxbridge Golf Course haul road satellite compound will:

- be operational for approximately 12 months, commencing in 2017 during construction of the haul road, and again for approximately 12 months during removal and reinstatement of the haul road planned to commence in 2023;
- support approximately 15 workers each day throughout each of the construction works periods;
- support approximately 3 workers each day throughout the period that the road is operational;
- not provide overnight worker accommodation;

- be accessed via the A40; and
- be managed from Northolt tunnel and earthworks main compound.

5.2.5 The haul road will be constructed during the HS2 enabling works. It will take approximately one year to construct. It will be in operation for up to seven years, and will take approximately a further one year to remove. A staffed gate will be provided where the haul road crosses PRow U50 to maintain PRow access. The construction traffic route via the A40 Western Avenue, the B467 Swakeleys Road and Harvil Road will be retained, although it will be subject to lower construction traffic flows than those reported in Part 1 of the SES and AP2 ES.

5.2.6 The provision of the haul road is not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: agriculture, forestry and soils; land quality; and socio-economics. However, there were changes where reassessment was considered to be required in respect of: air quality; community; cultural heritage; ecology; landscape and visual assessment; sound, noise and vibration; traffic and transport; and water resources and flood risk assessment.

Air quality

Introduction

5.2.7 This section of the report describes the environmental baseline in relation to air quality that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

5.2.8 The assessment scope, key assumptions and limitations and the methodology for determining significance of effects for air quality are set out in the SMR Addendum 3 (Volume 5: Appendix CT-001 -000/4) of the SES2 and AP3 ES.

5.2.9 Environmental Protection UK (EPUK)⁶ and the Institute of Air Quality Management have issued new guidance (2015) on the consideration of air quality within the land use planning and development control process. This guidance makes changes from the previous 2010 EPUK guidance in the process of determining the impact descriptors at each receptor. For the same predicted change in pollutant concentration, the new guidance is more likely to result in an impact descriptor of 'moderate' or 'substantial' compared with the use of previous version of the guidance. For example, where the baseline nitrogen dioxide concentration is 38µg/m³ and increases by 1.5µg/m³ to 39.5µg/m³ at a receptor with the scheme, the 2010 guidance would define the impact descriptor as 'slight adverse' whilst, for the same situation, the use of the 2015 guidance would result in an impact descriptor of 'moderate adverse'. Given that the HS2 air quality methodology defines moderate or substantial impacts as having a significant effect, the use of the new guidance is likely to result in a larger number of receptors with a significant effect being reported. This outcome is even more likely for

⁶ Environmental Protection UK is a national charity that provides expert policy analysis and advice on air quality, land quality, waste and noise and their effects on people and communities in terms of a wide range of issues including public health, planning, transport, energy and climate.

receptors where the baseline NO₂ concentration is in excess of the air quality standard, which is 40 µg/m³.

- 5.2.10 A comparison of the difference in impact descriptors arising from following the new guidance is shown in the tables of results for construction impacts in SES₃ and AP₄ ES, Volume 5, Appendix AQ-001-007.

Existing baseline

- 5.2.11 The baseline conditions with regard to air quality are as described in the SES and AP₂ ES.

Future baseline

Construction (2017)

- 5.2.12 There is no change to the future baseline for construction compared to the SES and AP₂ ES.

Operation (2026)

- 5.2.13 There is no change to the future baseline for operation compared to the SES and AP₂ ES.

Effects arising during construction

Avoidance and mitigation measures

- 5.2.14 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the CoCP.
- 5.2.15 The assessment of the AP₄ revised scheme has assumed that the general measures detailed in Section 7 of the draft CoCP (Volume 5: Appendix CT-003-000) in the main ES will be implemented.
- 5.2.16 The assessment of construction impacts has incorporated HS₂ Ltd's policy on the type of HGVs to be used, which states: "In order to help mitigate impacts on local air quality, in areas where there is action in place to meet EU limit values through the introduction of Low Emission Zones (such as the London Low Emission Zone), the nominated undertaker will require HGVs entering these designated zones during construction, for the purposes of transporting excavated material, to be powered by Euro VI (or lower emission) engines". Euro VI engines are required to have substantially lower emissions of NO_x and particulate matter than older engines.
- 5.2.17 No additional avoidance and mitigation measures are proposed for the AP₄ revised scheme.

Assessment of impacts and effects

Temporary effects

- 5.2.18 Examination of the changes in traffic flows along the affected roads has identified some areas that meet the criteria for a more detailed assessment, as set out in the SMR Addendum 3 (Appendix CT-001-000/4) of the SES₂ and AP₃ ES.
- 5.2.19 The main ES reported that properties on Swakeleys Road between Harvil Road and the A40 were expected to experience temporary substantial adverse impacts related

to NO₂ concentrations during construction that will be significant. Part 1 of the SES and AP2 ES reported the removal of these significant effects.

- 5.2.20 This resulted in the removal of the significant air quality effects identified in the main ES for the receptors on Swakeleys Road, between Harvil Road and the A40.
- 5.2.21 The traffic changes arising from the AP₄ revised scheme are described in the traffic and transport section. The assessment of the AP₄ revised scheme results in new significant beneficial effects for NO₂ at assessed receptors along Swakeleys Road and Lodore Green compared to Part 1 of the SES and AP₂ ES, as shown on map AQ-01-007 in the SES₃ and AP₄ ES, Volume 5, Air Quality Map Book.
- 5.2.22 The assessment also results in new significant beneficial effects at receptors along Swakeleys Road and The Drive, as shown on map AQ-01-007 in the SES₃ and AP₄ ES, Volume 5, Air Quality Map Book. These are reported due to the change in methodology for describing impacts, as reported in SES₃ and AP₄ ES, Volume 5: Appendix AQ-001-007. If the main ES assessment methodology were applied, these effects would not be significant.
- 5.2.23 The assessment does not result in any new or different significant effects for PM₁₀.
- 5.2.24 The main ES reported potentially significant effects on air quality for the Mid Colne Valley SSSI and Fray's Farm Meadows SSSI ecology receptors due to traffic movements along the A40. The assessment of the AP₄ revised scheme does not alter this conclusion.

Permanent effects

- 5.2.25 The SES and AP₂ ES reported no significant permanent effects on air quality during construction, and there is no change as a result of the AP₄ revised scheme.

Effects arising from operation

- 5.2.26 The AP₄ amendment will not give rise to new or different significant operational air quality effects in comparison with those reported in the SES and AP₂ ES.

Mitigation and residual effects

- 5.2.27 No other mitigation measures during construction are proposed in relation to air quality.
- 5.2.28 The assessment results in new significant beneficial residual effects for NO₂ at assessed receptors along Swakeleys Road, Lodore Green and The Drive.

Cumulative effects

- 5.2.29 There are no new or different likely significant cumulative effects for air quality as a result of the amendment acting in combination with another amendment in AP₄, or in AP₂, or as a result of any relevant committed development interacting with the AP₄ revised scheme.

Community

Introduction

- 5.2.30 This section of the report describes the environmental baseline in relation to community that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.2.31 The assessment scope, key assumptions and limitations for community are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.2.32 The baseline community information for CFA7, Colne Valley is described in the main ES (Volume 2, CFA7 Report, Section 5). Community facilities in the area include Uxbridge Golf Club.

Future baseline

Construction (2017)

- 5.2.33 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.2.34 None of the identified developments affect the assessment of the AP₄ amendment's likely construction impacts on community.

Operation (2026)

- 5.2.35 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.2.36 None of the identified developments affect the assessment of the AP₄ amendment's likely operational impacts on community.

Effects arising during construction

- 5.2.37 The haul road will require land that is currently used by Uxbridge Golf Course. The 12-hole course is managed by the London Borough of Hillingdon. The haul road will require land that currently comprises four holes at the north of the course, for approximately nine years in total. Some redesign of the course would allow the course to continue to function as a nine-hole course. There are nearby alternative golf courses including the adjacent Buckinghamshire Golf Club and Ruislip Golf Course; the latter is predicted to be affected by the original scheme.
- 5.2.38 The haul road will have a moderate adverse effect on Uxbridge Golf Course, resulting in a new significant effect.

5.2.39 The provision of a haul road means that there will be reductions to the traffic using the B467 Swakeleys Road.

5.2.40 The main ES reported that residents on B467 Swakeleys Road (between the junction with the A40 and the junction with Harvil Road) would experience in-combination effects arising from the combination of significant increases in HGV movements, significant road traffic noise effects and significant air quality effects, resulting in a major adverse effect that was significant. This effect was reported in the CFA7 assessment and the CFA6 (South Ruislip to Ickenham) assessment, since the road is on the boundary between the two CFAs. The significant effect remained in the SES and AP2 ES.

5.2.41 The provision of the haul road means that this significant effect is no longer predicted to occur.

Effects arising from operation

5.2.42 The haul road through Uxbridge Golf Course does not change the operation of the scheme and so there are no new or different significant operation effects for community as a result of the amendment, in comparison with the main ES.

Mitigation and residual effects

5.2.43 No further avoidance and mitigation measures additional to those reported in the main ES are proposed.

5.2.44 The new haul road will require land currently in use by Uxbridge Golf Course which will have a moderate adverse effect on the operators and users of the course during construction, which is a new significant residual effect.

5.2.45 The provision of the haul road will result in the removal of the significant residual amenity effect reported in the main ES on the residents of the B467 Swakeleys Road. Details of assessments of community resources are included in SES3 and AP4 ES, Volume 5, Appendix CM-001-007. Changes to significantly affected community resources are shown on maps CM-01-023-L1 in the SES3 and AP4 ES Volume 5, Community Map Book.

Cumulative effects

5.2.46 There are no new or different likely significant cumulative effects for community as a result of the amendment acting in combination with another amendment in AP4, or in AP2, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Cultural heritage

Introduction

5.2.47 This section of the report describes the environmental baseline in relation to cultural heritage that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.2.48 The assessment scope, key assumptions and limitations for cultural heritage are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/01) and the SMR Addendum (Volume 5: Appendix CT-001-000/02) of the main ES.

Existing baseline

- 5.2.49 The cultural heritage baseline for the assessment takes into account information collected for the main ES, which included walkover survey, geophysical survey, remote-sensing data, and data from national and local registers. A full list is provided in Volume 2, Section 6.3 of the main ES and updated in Volume 2, section 3.2 of the SES and AP2 ES, CFA7.
- 5.2.50 The land required for the amendment is with the Thames Terrace deposits (asset reference CVA044), the Roman road from Verulamium (St Albans) to Laleham (asset reference CVA111) and the former parkland of Harefield Place (asset reference CVA112).
- 5.2.51 The Thames Terrace deposits (asset reference CVA044) are of moderate heritage value due to the known focus of prehistoric and later settlement on the river, and the geological formation, which has the potential to contain archaeological deposits. There is other evidence of prehistoric activity 230m to the north, with Mesolithic archaeology at Dews Farm (asset reference CVA021), a heritage asset of moderate value. Before they were removed by aggregate extraction there was also evidence of a ring ditch (asset reference CVA010) 830m to the north of the amendment and further Mesolithic archaeology (asset reference CVA029) 1.3km to the north. These sites are no longer considered to have heritage value due to their removal.
- 5.2.52 The exact route of the Roman road from Verulamium (St Albans) to Laleham (asset reference CVA111) is not certain, but it is projected to run through the land required for the haul route. The full length of the road ran from Verulamium (St Albans) to Laleham, with the section within the land required for the amendment being approximately 20m of this route. The asset is of low heritage value.
- 5.2.53 The haul road will run through the former parkland of Harefield Place (asset reference CVA112) on its western boundary, now used by Uxbridge Golf Course. The asset includes a Grade II listed building, Harefield Place, and Pinnock Wood, an ancient woodland. The best surviving elements of the parkland, including Pinnock Wood, are clustered around Harefield Place. Harefield Place and former parkland (asset reference CVA112) is an asset of medium heritage value.

Future baseline

Construction (2017)

- 5.2.54 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.2.55 None of the identified developments affect the assessment of the AP4 amendment's likely construction impacts on cultural heritage.

Operation (2026)

- 5.2.56 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.2.57 None of the identified developments affect the assessment of the AP4 amendment's likely operational impacts on cultural heritage.

Effects arising during construction

- 5.2.58 The haul route will result in further groundwork in an area with a potential for archaeological deposits associated with the Thames Terrace deposits (asset reference CVA044) and a Roman road (asset reference CVA111). It will also run through the former parkland of Harefield Place (asset reference CVA112).
- 5.2.59 In the main ES, the moderate impact of the original scheme on the Thames Terrace deposits (asset reference CVA044), an asset of moderate heritage value, resulted in a significant moderate adverse effect. Although an additional 6.7ha is to be removed, when compared with the extent that will be removed by the SES scheme, and the large scale of the asset, this additional amount is not considered significant enough to result in a different effect to that reported in the main ES.
- 5.2.60 Given the overall extent of the assumed route of the Roman road (asset reference CVA111), the approximate 20m to be removed by the land required for the haul route will not significantly alter the ability to understand and appreciate the heritage asset. The amendment will result in a low adverse impact on the heritage asset and a minor adverse effect, which is not significant.
- 5.2.61 The haul road will result in 8.5% of the former parkland of Harefield Place (asset reference CVA112) being removed. However the land will be taken in a linear route and will run along the western edge of the heavily altered golf course area of the parkland. It will not encroach on any of the key features of the asset, including Pinnock Wood ancient woodland, the Grade II listed Harefield Place and the surviving garden features, which are clustered around Harefield Place. It will have an impact on the setting of Harefield Place from the noise of construction traffic. However, the proximity of the A40 and associated traffic noise, along with the heavy screening provided by the parkland tree planting, means this will be limited. The haul route is required for approximately nine years. Overall, the impact on the heritage asset will be temporary and low, with a minor adverse effect, which is not significant.

Effects arising from operation

- 5.2.62 The permanent construction effects will remain and there will be no further impact.
- 5.2.63 The haul route will not give rise to a new or different significant effect on cultural heritage during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.2.64 There will be no change to the mitigation and residual effects reported in Volume 2 of the main ES.

Cumulative effects

- 5.2.65 There are no new or different likely significant cumulative effects for cultural heritage as a result of the amendment acting in combination with another amendment in AP4, or in AP1 and AP2, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Volume 5 amendments

- 5.2.66 Table 7 sets out the additions to the main ES, Volume 5, Appendix CH-003-007.

Table 7: Additions to Volume 5, Appendix CH-003-007, Cultural Heritage – impact assessment tables

Unique identification	Name	Designation(s)	Value	Construction impact			Operation impact			New or different environmental effect from that reported in the main ES, AP1 ES or the SES and AP2 ES
				Nature of impact including mitigation	Scale of impact	Effect	Nature of impact including mitigation	Scale of impact	Effect	
CVA111	Roman road from Verulamium (St Albans) to Laleham	Non designated	Low	Approximately 20m of the overall assumed route will be removed. Given the extent of the route this removal of this length of the Roman Road will slightly affect the ability to understand and appreciate the significance of the asset.	Low adverse	Minor adverse	There will be no further impact from the operation of the scheme.	No change	Neutral	No new or different significant environmental effects have been identified.
CVA112	Harefield Place and former parkland	Grade II listed building Ancient woodland	Moderate	8.5% of the overall asset will be removed. However the land will be taken in a linear route and will run along the western edge of the heavily altered golf course area of the parkland. It will not encroach on any extant features of the asset including Pinnock Wood ancient woodland, the Grade II listed Harefield Place and the surviving garden features which are clustered around Harefield Place. There will be an impact on the setting of Harefield Place from the noise of construction traffic, however the proximity of the A40 and associated traffic noise, along with the heavy screening provided by the parkland tree planting, means this will be limited.	Temporary low adverse	Temporary minor adverse	There will be no further impact from the operation of the scheme.	No change	Neutral	No new or different significant environment effects have been identified.

Ecology

Introduction

- 5.2.67 This section of the report describes the environmental baseline in relation to ecology that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme and the following AP2 amendments: AP2-007-002 and AP2-007-003.

Scope, assumptions and limitations

- 5.2.68 Updates to the scope of the assessment for ecology are set out in Volume 1 of SES3 and AP4 ES. The key assumptions and limitations, and the methodology for determining significance of effects are as set out in Volume 1, the SMR and the SMR Addendum (Volume 5: Appendix CT-001-000/1 and CT-001-000/2) of the main ES and in Addendum 4 to the SMR (SES3 and AP4 ES Volume 5: Appendix CT-001-000/5).
- 5.2.69 To address any limitations in data, a precautionary baseline has been considered according to the guidance reported in the main ES, Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst-case' basis for the subsequent assessment. The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the AP4 revised scheme.

Existing baseline

- 5.2.70 The ecological baseline of the land required for the amendment has been based on: field data collated for the main ES; aerial photography; and relevant existing information gathered from national organisations and from regional and local sources including Greenspace Information for Greater London. A meeting with London Wildlife Trust was held in August 2015 and the information provided at the meeting and in subsequent correspondence have been incorporated into the assessment where relevant.
- 5.2.71 A summary of the baseline information relevant to the assessment of the amendment is provided below. This takes account of any relevant 2015 survey information provided in SES3 and AP4 ES, Volume 5, Appendix EC-001-002. For those receptors described in the main ES, further details are provided in Volume 2, CFA7, Section 7.3 and in Volume 5, including maps EC-01 to EC-12 of the main ES.

Designated sites

- 5.2.72 There are five statutory designated sites for nature conservation relevant to the assessment of the haul road. These include two SSSI, which are each of national value, and three LNR, which are each of district/borough value, as reported in the main ES:
- Fray's Farm Meadows SSSI (26.3ha) is designated for grassland habitats, including sedge-dominated wet grassland; wetland plants and invertebrates; and waders and wildfowl. The land required for the haul road is partially within the SSSI;

- Denham Lock Wood SSSI (6.8ha) is approximately 275m west of the land required for the haul road. It is designated for diverse wet woodland and swamp habitats;
- Fray's Valley LNR (71.8ha) is designated for woodland, grassland, scrub and wetland habitats. This LNR overlaps most of the Fray's Farm Meadows SSSI and is within the larger Mid Colne Valley SMI. The land required for the haul road is partially within the LNR;
- Denham Country Park LNR (19ha) is approximately 400m west of the land required for the haul road. It is designated for woodland, grassland, scrub and wetland habitats. This LNR is also within the larger Mid Colne Valley SMI; and
- Denham Quarry Park LNR (29ha) is approximately 400m west of the land required for the haul road. It is designated for wetland birds, invertebrates and grassland habitat. A small part of this LNR is within the Mid Colne Valley SMI.

5.2.73 There are five non-statutory designated sites for nature conservation relevant to the assessment of the haul road, comprising two SMI, and three SBI (one grade 1 and two grade 2). The SMI are each of county/metropolitan value and the SBI are each of district/borough value, as reported in the main ES:

- Mid Colne Valley SMI (321ha) is designated for riparian habitat with a diverse assemblage of aquatic and wetland plants, species-rich grassland and wet woodland. It is also designated for breeding and wintering water birds, invertebrates, water vole and harvest mouse. The land required for the haul road is partially within the SMI;
- London's Canals SMI (178ha) is approximately 375m west of land required for the haul road. It is designated for wetland plants and water birds. This site extends across the London canal system;
- Newyears Green SBI.I (18.7ha) is approximately 400m north-east of the land required for the haul road. It is designated for broadleaved woodland, which is dominated by pedunculate oak, ash and hornbeam. The site also supports the locally notable buckthorn and musk thistle;
- Harefield Hall and The Lodge SBI.II (11.2ha) is designated for broadleaved woodland. The land required for the haul road is partially within this SBI; and
- Brackenbury Railway Cutting SBI.II (4.9ha) is approximately 150m north-east of the land required for the haul road. It is designated for broadleaved woodland, which is dominated by pedunculate oak, elder and English elm.

5.2.74 Fray's Farm Meadows SSSI and additional land to the west within the Mid Colne Valley SMI forms the London Wildlife Trust's Fray's Farm Meadows Nature Reserve (33ha). It contains wet grazing meadows that are a rare habitat in London and that support a population of water vole as well as wetland birds (including wintering snipe), plants and invertebrates. This is not a formal designation and therefore its value is as stated for the designated sites it contains.

- 5.2.75 Pinnock Wood, an area of broadleaved ancient semi-natural woodland located outside of the designated sites identified above is situated adjacent to land required for the haul road.
- 5.2.76 Statutory and non-statutory designated sites for nature conservation within the wider study area are described in the main ES, Volume 2, CFA6 and CFA7, Section 7 and are shown on EC-01-011 to EC-01-013a, Volume 5, Ecology Map Book.

Habitats

- 5.2.77 The wet grassland present at Fray's Farm Meadows SSSI is relevant to the assessment and is a new receptor not previously identified in the main ES, due its distance from the scheme. The site comprises unimproved wet grassland, of which up to 0.3ha is within land required for the haul road. As a principal reason for the designation of the SSSI, this habitat is of national value.
- 5.2.78 Pinnock Wood is a broadleaved ancient semi-natural woodland that is situated adjacent to land required for the haul road. It is of county/metropolitan value, as reported in the main ES.
- 5.2.79 Two areas of semi-natural broadleaved woodland to the north of the A40 are partially within land required for the haul road, with approximately 0.3ha within the amendment area. They were not identified in the main ES due to their distance from the scheme. These woods are not on the ancient woodland inventory but may qualify as a habitat of principal importance. These woodlands are considered to be of up to district/borough value.
- 5.2.80 The main ES reports that hedgerows to the west of Harvil Road may qualify as important hedgerows and most are likely to qualify as a habitat of principal importance. However, given their limited extent and as they do not form a continuous network, these hedgerows are considered to be of local/parish value. Approximately 200m of additional hedgerow habitat is present within or adjacent to land required for the haul road. These hedgerows form part of the network west of Harvil Road which are reported in the main ES as being of local/parish value.
- 5.2.81 A number of other habitats are present within land required for the haul road, but none are likely to be greater than local/parish value as reported in the main ES. They include approximately 0.3ha of scrub habitat, of which some is within the land required at Fray's Farm Meadows SSSI; 0.5ha of poor semi-improved grassland at Harvil Farm; and 0.2ha of bare ground adjacent to and north of the A40. Approximately 3.3ha of amenity grassland present within Uxbridge Golf Course forms the majority of the land required within the amendment area.
- 5.2.82 Habitats surrounding the land required for the AP4 amendment are described in the main ES, Volume 2, CFA7, Section 7.3 and are shown on Maps EC-02-021b to EC-02-025a, Volume 5, Ecology Map Book.

Protected and/or notable species

- 5.2.83 Fray's Farm Meadows SSSI is suitable for wetland birds and there are pre-2000 records of bittern, curlew, greenshank and lapwing, with the latter present in the breeding season. There are also records of wintering snipe. It is understood from the London Wildlife Trust that there are no longer breeding waders present on the site, and that

its current use for these species is during winter and on migration only. The fen and scrub is suitable for a wide range of other breeding birds, including species of principal importance. As the bird assemblage is not a principal reason for the designation of the SSSI and based on the available data and the extent and variety of habitat in and adjacent to the site, the bird assemblage is considered to be of up to county/metropolitan value. This is a new receptor not previously identified in the main ES.

- 5.2.84 As stated in the citation, the wetland habitats at Fray's Farm Meadows SSSI support a diverse assemblage of invertebrates, particularly dragonflies and butterflies. There are records for a limited range of invertebrates that are species of principal importance including forester and broad-shaded bar moths, glow worm, small heath butterfly and a small number of beetles. The invertebrate assemblage is not a principal reason for the designation of the SSSI and based on the available data and the extent and variety of habitat in and adjacent to the site, the assemblage is considered to be of up to county/metropolitan value. This is a new receptor not previously of relevance for the main ES.
- 5.2.85 The presence of wetland plants that are uncommon in London, including ragged robin and marsh marigold, are mentioned in the reasons for designation of Fray's Farm Meadows SSSI. The area within land required for the haul road has not been surveyed; however, it is assumed that an assemblage of wetland plant species uncommon in London are present. This is a new receptor not previously identified in the main ES and is of county/metropolitan value.
- 5.2.86 There are records for water vole at Fray's Farm Meadows SSSI from 1999-2009 and their continued presence has been confirmed by the London Wildlife Trust. Water vole are a species of principal importance due to decline in numbers in nationally and in London. The water vole population associated with Fray's Farm Meadows SSSI was not reported in the main ES and is of county/metropolitan value.
- 5.2.87 The main ES identified a population of great crested newts potentially present in the vicinity of Uxbridge Golf Course, which is of up to county/metropolitan value. Hedgerow, scrub and grassland habitat present within land required for the haul road may provide suitable terrestrial habitat for this species.
- 5.2.88 A diverse assemblage of bat species using the wider landscape for foraging and commuting around Harvil Road is of up to county/metropolitan value, as reported in main ES. The land required for the haul road contains broadleaved woodland, hedgerows and scattered trees that provide suitable habitats for bats, and may be utilised by this assemblage.
- 5.2.89 The main ES reports that an otter population present along the River Colne and the Grand Union Canal, is of up to county/metropolitan value. There are a number of large lakes, water courses and drainage ditches surrounded by broadleaved woodland within the Fray's Valley LNR, which are located between the Grand Union Canal and the land required for the haul road. These habitats may be suitable for breeding otter.
- 5.2.90 The main ES identified populations of reptiles potentially present in the grassland and scrub around Uxbridge Golf Course, which are of up to county/ metropolitan value. The hedgerow, grassland and scrub present within land required for the haul road is likely to form part of the habitat used by the assumed population of reptiles in this area.

5.2.91 Badger populations that are recorded utilising land required for the construction of the original scheme are of local/parish value, as reported in the main ES. Given the presence of suitable habitat within land required for the haul road, this area may also support badgers.

5.2.92 Species identified within the area surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3. Locations of species records are shown on Maps EC-04 to EC-12, Volume 5, Ecology Map Book.

Future baseline

Construction

5.2.93 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES, and the SES and AP2 ES.

5.2.94 None of the identified developments affect the assessment of the amendment's likely construction impacts on ecology.

Operation (2026)

5.2.95 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES, and the SES and AP2 ES.

5.2.96 None of the identified developments affect the assessment of the amendment's likely operational impacts on ecology.

Effects arising during construction

Avoidance and mitigation measures

5.2.97 The assessment assumes implementation of the measures set out within the draft CoCP (Volume 5: Appendix CT-003-000 of the main ES), which includes translocation of protected species where appropriate.

5.2.98 The alignment of the haul road avoids Pinnock Wood which is an ancient woodland and therefore irreplaceable, and minimises habitat loss and fragmentation in the SSSI.

Designated sites

5.2.99 Approximately 0.4ha (1.5%) of habitat in Fray's Farm Meadows SSSI is within the land required for construction. This area comprises 0.3ha of wet grassland, a principal reason for the designation of the site. The extent and continuity of the wet grassland is important to the integrity of the site. The remaining habitats directly affected by the amendment comprise a 40m section of ditch and hedgerows, a treeline, willow scrub and wet woodland totalling 0.1ha.

5.2.100 The main ES reported that an increase in NOx concentrations and nutrient nitrogen deposition on a small part (0.2ha/0.8%) of Fray's Farm Meadows SSSI at its southern extent close to the A40 would not lead to long-term build up in deposition or a measurable change in the plant species-richness or abundance. The change in air

quality would be small in comparison with background concentrations and any such change would have a negligible effect. Therefore, the original scheme was not expected to give rise to significant effects on the integrity of Fray's Farm Meadows SSSI.

- 5.2.101 The main ES reported that increased NO_x concentrations and the nutrient nitrogen deposited would occur in approximately 0.2ha of the SSSI at its southern extent close to the A40. The temporary change in air quality during construction of the original scheme would be small in comparison with background concentrations and any such change would have a negligible effect on the SSSI. Construction traffic using the haul road through Uxbridge Golf Course to be provided under this amendment is expected to increase NO_x concentrations on the SSSI at its northern extent up to approximately 25m from the haul road, as reported in the air quality impacts assessment reported in the SES3 and AP4 ES, Volume 5 Appendix AQ-001-007. The increased NO_x concentrations will therefore affect approximately 0.9ha (3.4%) of the habitat within Fray's Farm Meadows SSSI, and has the potential to result in a measurable change in the plant species-richness or abundance in this area.
- 5.2.102 Due to the combination of land required for the amendment and increased effects of NO_x, the amendment will affect approximately 1.5ha of the SSSI (5.7%) in total. Although the change in air quality is likely to be small in comparison with background concentrations and the areas affected is limited, this will result in a new adverse effect on the integrity of Fray's Farm Meadows SSSI that will be significant at the national level.
- 5.2.103 The main ES reports that habitat loss at Fray's Valley LNR and Mid Colne Valley SMI would result in a significant effect on the integrity of these sites, which will be significant effect at the district/borough and county/metropolitan level respectively. The land required for construction of the haul road within the LNR and SMI directly overlaps with that required at Fray's Farm Meadows SSSI, and will remove grassland that is also a reason for designation of these sites. However, the extent of loss (0.5% of the LNR and 0.2% of the SMI) is relatively small in relation to the sites' size. Consequently the amendment will give rise to a different significant effect on the site integrity of both sites but this will not change the level of significance of the effects reported in the main ES.

Habitats

- 5.2.104 The wet grassland Fray's Farm Meadows SSSI will be adversely affected, as described previously for the assessment of effects on the SSSI. The amendment will result in loss of 0.3ha from one of the largest remaining areas of unimproved wet grassland in Greater London, which is a principal reason for the designation of the SSSI. In addition, as described above for designated sites an additional area of approximately 0.9ha will likely be affected by increased NO_x concentrations. These impacts will give rise to a new significant effect on the conservation status of the wet grassland significant at the national level.
- 5.2.105 The main ES reports that no significant impacts are expected on the ancient woodland within Pinnock Wood. The amendment involves the construction and operation of a haul route adjacent to Pinnock Wood for a total duration of approximately 9 years. Dust deposition will be minimised through the implementation of the CoCP, however

low levels of dust deposition are still likely to occur along the boundary that adjoins the haul route

- 5.2.106 When in use the haul road, which will extend parallel to the western edge of Pinnock Wood, will lead to increased NO_x concentrations on this ancient woodland habitat up to approximately 25m from the haul road, as assessed for air quality impacts reported in the Volume 5, SES3 and AP4 ES Appendix AQ-001-007. The increased NO_x concentrations will affect approximately 0.3ha (13.5%) of the ancient woodland habitat at Pinnock Wood for a total duration of nine years during construction, operation and removal of the haul route. The impacts of nitrogen and dust deposition give rise to a new significant effect and will change the level of significance of the effect arising from the original scheme from negligible to a temporary adverse effect that will be significant at the county/metropolitan level.
- 5.2.107 The main ES reports that approximately 30ha of broadleaved woodland will be lost as a result of the original scheme which includes 24ha of semi-natural broadleaved woodland and 6ha of plantation broadleaved woodland. This would result in a permanent adverse effect on the conservation status of this habitat which is significant at the county/metropolitan level for woodlands within the Colne Valley SSSI and/or SMI, and at the district/borough level for other areas of woodland. Construction of the haul road through Uxbridge Golf Course will lead to the removal of a total of approximately 0.3ha of non-ancient semi-natural broadleaved woodland from two small areas of woodland to the north of the A40. The area of lowland mixed deciduous woodland in Hillingdon is approximately 890ha, therefore the loss resulting from the construction of the haul road will not give rise to new or different significant effects and will not change the level of significance reported in the main ES.
- 5.2.108 It is unlikely that the amendment will result in any other effects on species receptors of relevance at more than the local/parish level. Additional local/parish level effects (i.e. in addition to those identified in the main ES) arising from AP4 revised scheme are listed in SES3 and AP4 ES Volume 5: Appendix EC-003-002.

Protected and/or notable species

- 5.2.109 The area within land required for the haul road within Fray's Farm Meadows SSSI has not been surveyed but it is assumed that wetland plants and notable invertebrate species are present. However, the loss of approximately 0.4ha of habitat is a proportionally small extent of the total habitat within the SSSI. Through assessment of aerial imagery, the area of habitat that will be lost appears to be representative of that present within the remainder of the site. On this basis, it is likely that the wetland plants and notable invertebrate species are broadly distributed throughout the SSSI and not disproportionately concentrated in the area affected by the amendment. The location of the haul road also passes through the SSSI along its north-eastern boundary, thus avoiding fragmentation of the remaining grassland habitat within the SSSI. Therefore, the amendment is not expected to give rise to a new significant effect on the conservation status of wetland plants or the invertebrate assemblage in this area.
- 5.2.110 The maintenance of the breeding bird assemblage associated with the SSSI and affected by the haul road depends on the extent and connectivity of suitable habitat, and an absence of disturbance. In addition to 0.3ha of wet grassland, the amendment

involves removal of scrub and 200m of hedgerows that will provide breeding and foraging habitat. It will also result in noise and visual disturbance from the presence of lorries and people during the nine-year construction period, when it is in use and during its removal. However, disturbance will cease after this period and the extent of habitat loss is limited in the context of what is available within and adjacent to the SSSI. Therefore, the amendment will give rise to a new temporary adverse effect on the conservation status of the breeding bird assemblage in this area, significant at up to the county/metropolitan level.

- 5.2.111 The main ES reports that construction of the original scheme will remove habitat suitable for great crested newt, including ponds and ditches in the vicinity of Uxbridge Golf Course, which will result in a permanent adverse effect on the conservation status of the great crested newt population in this area that would be significant at up to the county/metropolitan level. The haul road will not result in the loss of great crested newt breeding habitat. However, it will lead to the loss of terrestrial habitat, including approximately 200m of hedgerow, 0.2ha of scrub and 0.3ha of semi-improved grassland habitat within 250m of the nearest water body assumed to be used for breeding. As such, the amendment will result in a different significant effect on the conservation status of great crested newt in this area. However, this will not change the level of significance of the effects reported in the main ES.
- 5.2.112 Construction of the haul road will involve the removal of mature trees which were not accessible for survey and are potentially used by the assemblage of bats in the vicinity of Harvil Road that was identified in the main ES. Although there is abundant alternative roosting and foraging habitat within the wider landscape of the Colne Valley, as reported in main ES, and the extent of woodland affected by the amendment is also limited, on a precautionary basis the removal of these trees could lead to the loss of important bat roosts. Therefore the potential presence of bat roosts could give rise to a new significant effect on the conservation status of bat populations in this area, is significant at the county/metropolitan level.
- 5.2.113 The haul road will require vegetation clearance and culverting of ditches that will remove and fragment habitat suitable for water vole. Water vole may be present in the vicinity of the land required for the amendment and it is possible that it could result in the removal of areas used for breeding. Therefore, on a precautionary basis, the amendment could give rise to a new significant effect on the conservation status of water vole in this area that is significant at the county/metropolitan level.
- 5.2.114 The main ES reported that an otter holt could be present within land required for construction of the original scheme, and the loss of a breeding site could result in an adverse effect on conservation status that would be significant at up to the county/metropolitan level. The haul road will involve clearance of vegetation within 100m of the large lakes within Fray's Valley LNR that could support a breeding site. Therefore, the amendment would give rise to a different significant effect on the conservation status of the otter population in this area. However, this will not change the level of significance of the effects reported in the main ES.
- 5.2.115 The main ES reports that grassland and scrub within the vicinity of Uxbridge Golf Course will be removed, which would result in a permanent adverse effect on the conservation status of reptiles that is significant at up to the county/metropolitan level. Additional hedgerow, grassland and scrub habitat present within land required

for the haul road, which is continuous with that present around Uxbridge Golf Course, will be lost as a result of the amendment. There will also be additional loss of habitat suitable for reptiles within Fray's Farm Meadows SSSI. As such, the amendment will result in a different significant effect on the conservation status of reptiles in this area. However, this will not change the level of significance of the effects reported in the main ES.

- 5.2.116 It is unlikely that the amendment will result in any other new or different effects on protected and/or notable species receptors of relevance at more than the local/parish level. Local/parish level effects which are in addition to those identified in the main ES and the SES and AP₂ ES are listed in Volume 5: Appendix EC-003-002 of the SES₃ and AP₄ ES.

Cumulative effects

- 5.2.117 Part 2 of the SES and AP₂ ES reports that amendment AP₂-007-002 and AP₂-007-003 would result in an additional loss of approximately 500m² of habitats from the Fray's Valley LNR and Mid Colne Valley SMI, representing a small increase to the area required for the original scheme. The combined habitat losses resulting from the construction of the haul road and amendments AP₂-007-002 and AP₂-007-003 total approximately 3.7ha (0.5% of the site) from Fray's Valley LNR and 6.5ha from the Mid Colne Valley SMI (0.2% of the SMI). In both cases the losses are small in relation to the size of the site. Consequently, cumulatively amendments will give rise to different significant effects on the integrity of both the Fray's Valley LNR and Mid Colne Valley SMI. However, in both cases this will not change the level of significance of the effect reported in the main ES and Part 2 of the SES and AP₂ ES.
- 5.2.118 Part 2 of the SES and AP₂ ES reports that amendment AP₂-007-002 requires the removal of approximately 700m² of habitat from Harefield Hall and The Lodge SBI.II. Construction of the haul road will lead to the removal of an additional 0.1ha of habitat from Harefield Hall and The Lodge SBI.II. However, the habitat to be lost comprises amenity grassland and scattered scrub, neither of which are habitats for which the site is designated. The combined habitat losses at Harefield Hall and The Lodge SBI.II resulting from construction of the haul road and amendment AP₂-007-002 totals 0.2ha, which will result in a different adverse effect on the integrity of the site. However, the effect will remain significant at the district/borough level, as reported in Part 2 of the SES and AP₂ ES.
- 5.2.119 Part 2 of the SES and AP₂ ES reports that amendments AP₂-007-002 and AP₂-007-003 would result in the removal of an additional 0.8ha of grassland and 0.5ha of woodland that forms terrestrial habitat for the great crested newt population in the vicinity of Uxbridge Golf Course. Amendment AP₄-006-002 would not result in the loss of breeding habitat. However, it will lead to the temporary loss of terrestrial habitat, including approximately 250m of hedgerow and 0.5ha of improved grassland within 250m of the nearest potential great crested newt breeding water body. The combined loss of habitat suitable for great crested newt resulting from the additional land required for the haul road, AP₂-007-002, AP₂-007-003 and AP₄-006-002 totals 1.6ha of grassland, 450m of hedgerow 0.2ha of scrub and 0.5ha of woodland. This would lead to a different significant effect on the conservation status of great crested newt at Uxbridge Golf Course, but the effect would remain significant at the county/metropolitan level as reported in the main ES.

5.2.120 Part 2 of the SES and AP₂ ES reports that amendment AP₂-007-002 would result in the removal of an additional 0.5ha of grassland, parts of which may be suitable reptile habitat. The land required for the amended sustainable placement proposals (AP₄-006-002) will result in the loss of an additional 1.5km of hedgerow, 7.5ha of improved grassland and 500m² of scrub within the new material stockpile areas at Harvil Farm, which is continuous with that present around Uxbridge Golf Course. The combined loss of habitat suitable for reptiles resulting from the additional land required for the amended sustainable placement proposals, AP₂-007-002 and AP₄-006-002 totals approximately 14ha in addition to 1.5km of hedgerow. This will lead to a different significant cumulative effect on the conservation status of reptiles, but the effect will remain significant at the county/metropolitan level, as reported in the main ES.

5.2.121 There are no new or different likely significant cumulative effects for ecology as a result of the AP₄ amendments interacting with any relevant committed development.

Mitigation and residual effects

Other mitigation measures

5.2.122 Mitigation for the direct loss of up to 0.3ha of wet grassland and 0.1ha of other mixed habitat, and temporary effects on 1.5ha of mixed habitat that occur at Fray's Farm Meadows SSSI as a result of the amendment will include habitat reinstatement once the haul road is no longer in operation. This will be undertaken in line with the principles of mitigation (Volume 5: Appendix CT-001-000/2). In isolation, these measures are unlikely to be sufficient to reduce the adverse effect to a level that is not significant. Additional compensation proposals to address any residual effects will be developed in consultation with relevant landowners, the London Wildlife Trust and Natural England. Measures may include habitat enhancement within the unaffected areas of the SSSI and habitat creation.

5.2.123 Additional mitigation measures will also be required to address effects on Pinnock Wood associated with changes in air quality and dust deposition. Measures may include the development of a monitoring strategy to be incorporated into the Local Environmental Management Plan (LEMP) and/or habitat enhancement in the unaffected areas of the woodland and habitat creation. This would be brought forward by agreement with relevant landowners.

5.2.124 The areas of habitat affected by the amendment that may support water vole are limited in extent, mitigation measures are likely to include habitat manipulation to exclude them in advance of construction of the haul route. However, if a translocation exercise and receptor site is later required to maintain the conservation status, areas of wetland habitat created in advance of construction at Harefield No. 2 Lake or Harefield Moor Lake, as described in the main ES, could be used. Through the implementation of these measures it is expected that any adverse effects on water vole arising from activities associated with the haul road will be reduced to a level where they are not significant.

5.2.125 The main ES reports that compensatory habitat to address the impacts on the possible great crested newt population at Uxbridge Golf Course will be provided in wet grassland created near the National Grid feeder station area and woodland planting near Harvil Road. The habitats within the land required for the amendment will also be reinstated post-construction. Together these measures will address the

different effect on the great crested newt population at Uxbridge Golf Course, and reduce the effects to a level where they are not significant.

- 5.2.126 The main ES reports that although no significant impacts on the conservation status of any bat species or assemblages are expected in CFA7, there are a number of compensatory measures that will address any effects. These measures will include woodland and wetland creation, and the creation of new bat roosting habitat in the land required for construction of the scheme as set out in the principles of mitigation (Volume 5: Appendix CT-001-000/2) to mitigate for the removal of bat roosts in bat boxes and trees. The potential loss of bat roosts as a result of the haul road will be addressed through appropriate measures described in the main ES. Through the implementation of these measures it is expected that any adverse effects on bats arising from activities associated with the haul road will be reduced to a level where they are not significant.
- 5.2.127 The main ES concludes that if an otter holt were to be lost in this area due to construction of the original scheme, it will be replaced in one of the wetland compensation areas provided in CFA7 in accordance with the principles of mitigation (Volume 5: Appendix CT-001-000/2). The potential loss of an otter holt as a result of the haul road will be addressed through appropriate measures, including the provision of replacement holts within the limits of the Bill where required as described in the main ES. Through the implementation of these measures it is expected that any adverse effects on the otter population arising from activities associated with the haul road will be reduced to a level where they are not significant.
- 5.2.128 Compensatory habitat to address the impacts on the possible reptile populations around Uxbridge Golf Course will be provided in wet grassland created near the National Grid feeder station area and the woodland creation area near Tilehouse Lane, as reported in the main ES. The habitats within the land required for the amendment will also be reinstated post-construction. The compensatory habitat will also effectively mitigate the adverse effect on the potential reptile population within Frays Farm Meadows SSSI. As such, no additional mitigation measures (i.e. in addition to those identified in the main ES) are required, and the main ES measures are sufficient to address the different effect on reptiles arising as a consequence of the amendment.

Summary of likely residual significant effects

- 5.2.129 The mitigation, compensation and enhancement measures described reduce the significant effects arising from the amendment to a level that is not significant except for the following effects:
- permanent loss of 0.3ha of wet grassland and 0.1ha of other mixed habitat within Frays Farm Meadow SSSI. In addition a further 0.9ha of the habitat within the SSSI will be temporarily impacted by increased NO_x concentrations. Together these impacts result in a significant temporary adverse residual effect on the integrity of the site. This is a new residual effect significant at the national level;
 - the direct loss of 0.3ha from one of the largest remaining areas of unimproved wet grassland in Greater London, resulting in a permanent adverse residual

effect on the conservation status of this habitat. This is a new residual effect significant at the national level; and

- construction of the haul road, will lead to increased NO_x concentrations and dust deposition on ancient woodland at Pinnock Wood, resulting in a significant temporary adverse residual effect on the conservation status of this habitat for approximately 9 years. This is a new residual effect significant at the national level.

Effects arising from operation

- 5.2.130 The haul road through Uxbridge Golf Course does not change the operation of the scheme and so there are no new or different significant operation effects for ecology as a result of the amendment, in comparison with the main ES.

Landscape and visual assessment

Introduction

- 5.2.131 This section of the report describes the environmental baseline in relation to landscape and visual that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.2.132 The assessment scope, key assumptions and limitations for the landscape and visual assessment are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES. Updates to the methodology for the landscape and visual assessment are also described in Volume 1 of the AP1 ES and Volume 1 of the SES and AP2 ES.

Existing baseline

- 5.2.133 A summary of the baseline information in the main ES relevant to the assessment of the SES3 design changes is provided below. Further details are provided in the main ES Volume 2, CFA7, Section 9. Maps are provided in Volume 5, Landscape report LV-001-007.
- 5.2.134 The area of land required for the amendment is located within the Harefield Farmland Valley LCA and Colne Valley LCA as described in the main ES (Volume 2, CFA7, Section 9).
- 5.2.135 The Harefield Farmland Valley LCA is a predominantly agricultural area with pasture and arable farmland and areas of woodland, including Newyears Green Covert and Copthall Covert. The existing Chiltern Main Line overhead power lines and other infrastructure detract from the overall quality of the area. The landscape is in fair condition, tranquillity is medium and the LCA is located within green belt. This area has a high sensitivity to change.
- 5.2.136 The varied landscape of the Colne Valley LCA includes the River Colne, the Grand Union Canal, lakes developed from mineral extraction, farmland, woodland, golf courses and urban fringe. Busy roads and railway lines detract from the overall quality

of the area. The landscape is in fair condition, tranquillity is medium and the LCA is in the green belt. This area has a high sensitivity to change.

- 5.2.137 Viewpoint 049.3.005: View west from PRoW (Footpath U50) and the golf course is in close proximity to the land required for the amendment and is described in the main ES (Volume 2, CFA7, Section 9).
- 5.2.138 A new viewpoint has been included for the assessment of the amendment: Viewpoint AP4.049.2.008: view south and west from The Drive and Georgian Close. The foreground of the view from these properties is of back gardens, fences and boundary vegetation. Visible from upper floor windows, over the gardens, are Uxbridge Golf Course, an area of woodland (Weatherlys Covert) and Uxbridge Road. This viewpoint is further described in Volume 5: Appendix LV-001-007, Section 4 of the SES3 and AP4 ES.

Future baseline

Construction (2017)

- 5.2.139 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified in the main ES and the SES and AP2 ES.
- 5.2.140 None of the identified developments affect the assessment of the AP4 amendment's likely construction impacts on the landscape and visual assessment.

Operation (2026)

- 5.2.141 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified in the main ES and the SES and AP2 ES.
- 5.2.142 None of the identified developments affect the assessment of the AP4 amendment's likely operational impacts on the landscape and visual assessment.

Effects arising during construction

Landscape assessment

- 5.2.143 The Harefield Farmland Valley LCA was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to the construction of the Colne Valley viaduct, the presence of satellite compounds, the use of land east of Harvil Road for segment casting and a sustainable placement area, demolition of buildings, vegetation removal and an increase in traffic movements. The works will result in the addition of new features and components that will substantially alter the character, setting and tranquillity of the LCA.
- 5.2.144 The haul road, signalised junction and the road embankments will increase the number of incongruous features in the landscape. However, in the context of the large scale works taking place in the LCA as part of the scheme, they will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or in SES3 in Part 1 of this CFA report.

- 5.2.145 The Colne Valley LCA was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a moderate adverse significant effect during construction due to the construction works on the Colne Valley viaduct, the presence of satellite compounds and an access road, the River Colne diversion and the removal of vegetation. The works will result in the addition of construction features and components that will substantially alter the character, setting and tranquillity of the LCA.
- 5.2.146 The haul road will run through Uxbridge Golf Course and Weatherlys Covert, resulting in the removal of approximately 920m² of vegetation from the woodland and 170m of hedgerow and 0.6ha of trees and woodland clumps from the golf course. The road, the embankments, the construction compound at the A40 junction and the temporary bridge on the golf course will increase the number of incongruous features in the landscape. They will be seen in the context of the large scale works taking place in the LCA as part of the scheme. However, they will affect part of the LCA which is currently relatively undisturbed by the original scheme. Therefore the amendment will give rise to a different significant effect but will not change the level of significance of the effects reported in the main ES or in SES3 in Part 1 of this CFA report.

Visual assessment

- 5.2.147 Viewpoint 049.3.005: View west from PRoW (Footpath U50) and the golf course was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during construction due to open and direct views of the topsoil storage area, offices and welfare buildings, segment fabrication, sustainable placement areas and the treatment plant for excavated material.
- 5.2.148 The haul road and the signalised junction will increase the number of incongruous and highly visible features such as lorry movements in the view. However, seen in the context of the large scale sustainable placement works of the original scheme, it will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or in SES3 in Part 1 of this CFA report.
- 5.2.149 The haul road, road embankment, construction compound at the A40 junction and the temporary bridge on the golf course will be new features in the view from Viewpoint AP4.049.2.008: view south and west from The Drive and Georgian Close. Most views of construction activity from ground level will be partly or fully screened by vegetation growing in gardens or on the golf course. There are potential views of the haul road construction activity from upper storey windows. The removal of part of Weatherlys Covert will also open up views from The Drive looking south-west.
- 5.2.150 The magnitude of change will be medium, which combined with the high sensitivity of the receptor will result in a new moderate adverse significant effect during construction.

Effects arising from operation

Landscape assessment

- 5.2.151 The Harefield Farmland Valley LCA was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a

major adverse significant effect during year one of operation, reducing to moderate adverse significant by year 15 when mitigation planting will have partly integrated the scheme into the landscape. By year 60, effects will be further reduced to negligible, which is non-significant. The effects reported are due to the presence of the Colne Valley viaduct, overhead line equipment and trains and the Ickenham auto-transformer and National Grid feeder stations in the landscape, introducing prominent built elements into the LCA which alter its character.

- 5.2.152 The haul road and junction will be removed at the end of construction and the land returned to its former use. Hedgerows and vegetation removed during construction will be replanted. The footprint of the haul road will be apparent in year one of operation but as replacement seeding and planting becomes established, it will gradually integrate into the landscape. The amendment will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES or in SES3 in Part 1 of this CFA report.
- 5.2.153 The Colne Valley LCA was assessed as being affected by the original scheme and will also be affected by this amendment. The main ES reported a major adverse significant effect during year one of operation, reducing to moderate adverse significant in years 15 and 60 when replacement planting will have established and partly restored the vegetation patterns of the LCA. The effects reported are due to the presence of the Colne Valley viaduct crossing the valley and associated noise barriers.
- 5.2.154 The haul road, junction and construction compound at the A40 junction will be removed at the end of construction and the land returned to its former condition. Vegetation lost from the golf course and Weatherlys Covert will be replanted. The footprint of the haul road and construction compound will be apparent in year one of operation but as replacement seeding and planting becomes established, it will gradually integrate back into the landscape. The amendment will give rise to a different effect but will not change the level of significance of the effects reported in the main ES.

Visual assessment

- 5.2.155 Viewpoint 049.3.005: View west from PRoW (Footpath U50) and the golf course was assessed as being significantly affected by the original scheme and will also be affected by this amendment. The main ES reported a moderate adverse significant effect during year one of operation, reducing to minor adverse, which is non-significant by years 15 and 60 when reinstatement planting on the golf course will have established.
- 5.2.156 The haul road, temporary bridge and construction compound at Harvil Road will be removed at the end of construction and the land returned to its former use. Vegetation lost from the golf course will be replanted. The footprint of the haul road and construction compound will be clearly visible in year one of operation but as replacement seeding and planting becomes established, it will be gradually screened from the view. The amendment will therefore give rise to a different significant effect in year one of operation, but will not change the level of significance of the effect reported in the main ES. By years 15 and 60 the effect will reduce to negligible, which is non-significant due to the planting.

- 5.2.157 The footprint of the haul road and construction compound will be visible in year one of operation from Viewpoint AP4.049.2.008: view south and west from The Drive and Georgian Close. As replacement seeding and planting of Weatherlys Covert and the golf course becomes established, it will be gradually screened from the view. Views of the footprint from ground level will be partly or fully screened by vegetation growing in gardens or on the golf course. There will be screened and filtered views through garden and golf course trees to the haul road and construction compound in the background. The magnitude of change will be low, which combined with the high sensitivity of the receptor will result in a minor adverse effect in operation. By years 15 and 60, effects will be reduced to negligible, which is non-significant, due to the maturing of replacement planting on the golf course and in Weatherlys Covert. The amendment will not give rise to a new or different significant effect during operation, and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.2.158 Trees, shrubs and hedgerows removed from the Uxbridge Golf Course and Weatherlys Covert will be replanted.
- 5.2.159 The route of the haul road and location of the construction compounds will be designed to minimise the loss of vegetation on the golf course and south of The Drive and Georgian Close.
- 5.2.160 The amendment will give rise to a different significant effect on the Colne Valley LCA during construction but will not change the level of significance of the residual effects reported in the main ES (moderate adverse).
- 5.2.161 The amendment will give rise to a moderate adverse significant residual effect during construction on a new receptor: Viewpoint AP4.049.2.008: view south and west from The Drive and Georgian Close.

Cumulative effects

- 5.2.162 There are no new or different likely significant cumulative effects for landscape and visual assessment as a result of the AP4 amendments interacting with one another, the AP1 amendments, AP2 amendments or any relevant committed development.

Sound, noise and vibration

Introduction

- 5.2.163 This section of the report describes the environmental baseline in relation to sound, noise and vibration that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.2.164 The assessment scope, key assumptions and limitations for sound, noise and vibration are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/01) and the SMR Addendum (Volume 5: Appendix CT-001-000/02) of the main ES.
- 5.2.165 Local assumptions and limitations for sound, noise and vibration are set out in main ES Volume 2 CFA7 report.

Existing baseline

- 5.2.166 The baseline sound environment for those assessment locations considered in the main ES (Volume 2, CFA7 and Volume 5 Appendix SV-002-007) are representative of the assessment locations affected by this amendment.
- 5.2.167 Additionally, the assessment of construction sound, noise and vibration for the haul road through Uxbridge Golf Course involves assessment of new locations in addition to those previously identified in the main ES. The baseline sound levels for the new assessment locations are presented in SES3 and AP4 ES Volume 5: Appendix SV-002-007. No further measurements have been undertaken for the assessment of the AP4 amendment.
- 5.2.168 In Uxbridge, Northolt and nearby areas, the dominant sound source is road traffic using the A40 Western Avenue. Properties situated close to this road are exposed to relatively high daytime sound levels of around 60 to 65dB. Further back from the A40, Western Avenue, sound levels reduce to around 50dB. Other sound sources in the area include other main roads, B467 Swakeleys Road and Harvil Road, intermittent local road traffic and overflying aircraft.
- 5.2.169 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in the SES3 and AP4 ES, Volume 5: Appendix SV-002-007.

Future baseline

Construction (2017)

- 5.2.170 With the exception of the addition of baseline sound levels for the new assessment locations, the future baseline for construction in 2017, and construction traffic in 2021, remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Operation (2026)

- 5.2.171 The future baseline for operation in 2026 remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Effects arising during construction

- 5.2.172 The amendment will lead to additional works associated with the construction, use and removal of the haul road and changes to road traffic flows associated with the amendment. Construction traffic using the haul road will also generate noise.
- 5.2.173 An assessment has been undertaken to determine whether construction noise and vibration associated with the AP4 amendment will result in a likely significant effect, using the significance criteria detailed in the main ES (Volume 5: Appendix SV-001-000).
- 5.2.174 More detailed information regarding the construction sound, noise and vibration assessment for this amendment is available in SES3 and AP4 ES Volume 5: Appendix SV-003-007.

Residential and non-residential receptors: direct effects

- 5.2.175 The closest noise-sensitive receptors within CFA7 to the amendment are the Fairways Carvery Restaurant and the residential properties on The Drive, located generally to the east of the AP₄ amendment.
- 5.2.176 In the main ES, no likely significant direct construction noise effects on residential or non-residential receptors were identified in the vicinity of the land required for the amendment in CFA7.
- 5.2.177 The construction works and traffic associated with the amendment will not give rise to new or different direct significant effects on residential receptors in comparison with those reported in the main ES.
- 5.2.178 A new significant noise and vibration effect at Fairways Carvery Restaurant (CSV07-No4) has been identified on a reasonably foreseeable worst-case basis due to daytime construction noise associated with the works to construct and remove the haul route that are closest to the restaurant. The reasonable worst-case forecast noise levels at the restaurant are up to 62dB for a total period of approximately 11 months.
- 5.2.179 There are no other new or different significant effects on non-residential receptors as a result of the amendment.

Residential and non-residential receptors: Indirect effects

- 5.2.180 In the main ES, a likely significant indirect noise effect caused by construction traffic was reported at residential receptors immediately adjacent to the following roads:
- Harvil Road between the junction of Harvil Road and B467 Swakeleys Road and the scheme (CSV07-Co1); and
 - B467 Swakeleys Road between the junction with Harvil Road and the A40 (CSV07-Co2).
- 5.2.181 The AP₄ amendment will result in the removal of these likely significant indirect noise effects.
- 5.2.182 Significant noise effects on residential and non-residential receptors arising from construction traffic are unlikely to occur in this area.

Effects arising from operation

- 5.2.183 As the amendment is during the construction phase only, the AP₄ amendment will not give rise to a new or different significant operational noise or vibration effect and will not change the significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.2.184 The assessment of construction noise and vibration assumes the implementation of the principles and management processes set out in the draft CoCP (main ES Volume 5: Appendix CT-003-000).
- 5.2.185 In addition to the construction noise mitigation referred to in the main ES, taller screening as described in the draft CoCP has been assumed along the edge of the construction compound boundaries and haul road.

- 5.2.186 On a reasonable worst-case basis, noise from specific construction activities for the haul road has been identified as resulting in significant residual temporary effects on Fairways Carvery Restaurant, a non-residential receptor.
- 5.2.187 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so, HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.
- 5.2.188 The AP4 amendment will result in the removal of the likely residual significant noise effects arising from construction traffic on Harvil Road and B467 Swakeleys Road identified in the main ES.

Cumulative effects

- 5.2.189 This assessment has considered the potential cumulative construction noise effects of the scheme and other committed developments.
- 5.2.190 There are no new or different likely significant cumulative effects for sound, noise and vibration as a result of the AP4 amendments, interacting with one another, or with any AP1 or AP2 amendments, or as a result of any relevant committed development.

Traffic and transport

Introduction

- 5.2.191 This section of the report provides a description of the environmental baseline in relation to traffic and transport that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to the SES3 scheme taking into account any relevant AP2 amendments.
- 5.2.192 The A40 Western Avenue, B467 Swakeleys Road and Harvil Road form the boundary between the South Ruslip to Ickenham area (CFA6) and CFA7. The traffic and transport effects upon these roads are solely reported in Volume 2, CFA6 of the SES3 and AP4 ES.

Scope, assumptions and limitations

- 5.2.193 The assessment scope, key assumptions and limitations for the traffic and transport assessment are as set out Volume 1, the SMR (Appendix CT-001 -000/1) and the SMR Addendum (Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.2.194 The baseline traffic and transport information for Colne Valley is as described in the main ES (Volume 2, CFA7) and the SES and AP2 ES.
- 5.2.195 Footpath U50 crosses Uxbridge Golf Course and is used as a main access onto the golf course. Whilst flows are highly seasonal, peak pedestrian flows could exceed 200 pedestrians per day.

Future baseline

Construction

- 5.2.196 The future baseline for construction is as described in the main ES, Volume 2, CFA7, Section 12 and the SES and AP2 ES.

Operation (2026 and 2041)

- 5.2.197 The future baselines for operation are described in the main ES, Volume 2, CFA7, Section 12 and the SES and AP2 ES.

Effects arising during construction

- 5.2.198 The new haul road will cross Footpath U50. Although the crossing will be staffed to ensure safe and convenient use, this will result in a minor adverse significant change in traffic related severance for non-motorised users at the intersection of the new haul road and Footpath U50.

Effects arising from operation

- 5.2.199 The haul road is temporary and will not give rise to new or different significant effects on traffic and transport during operation and will not change the level of significance of the effects reported in the main ES and the SES and AP2 ES.

Mitigation and residual effects

- 5.2.200 A staffed crossing will be provided where the haul road crosses the footpath, to maintain safe and convenient PRow access. No changes to mitigation measures reported in Volume 2, CFA8, Section 12 of the main ES are proposed.
- 5.2.201 There will be a new minor adverse significant residual effect on traffic related severance for non-motorised users at the intersection of the new haul road and Footpath U50.
- 5.2.202 The significant effects that result from construction of the new haul road through Uxbridge Golf Course are shown on map TR-03-051 in SES3 and AP4, ES Volume 5: CFA7 Traffic and Transport Map Book.

Cumulative effects

- 5.2.203 The above assessment has taken into account cumulative effects, including any planned development by taking account of background traffic growth, as well as traffic and transport impacts of works being undertaken in neighbouring areas.
- 5.2.204 The minor adverse significant traffic severance effect for users of U50 due to the provision of a haul road through Uxbridge Golf Course that crosses the footpath will combine with the moderate significant adverse effect for users of Footpath U50 due to the temporary diversion (AP4-006-002). This will result in a new temporary cumulative effect.

Water resources and flood risk assessment

Introduction

5.2.205 This section of the report describes the environmental baseline in relation to water resources and flood risk that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

5.2.206 The assessment scope, key assumptions and limitations for water resources and flood risk are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001 -000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

5.2.207 The design of haul road drainage and flood risk mitigation is not yet complete. Therefore, following a precautionary approach for this assessment, impacts without mitigation are based on the following assumptions:

- either no road drainage is included or that road drainage will discharge directly to surface water courses un-attenuated and without any pollution prevention measures; and
- no flood mitigation is in place.

Existing baseline

5.2.208 A summary of the baseline information relevant to the assessment of the amendment is provided. For those receptors described in the main ES, further details are provided in the main ES Volume 2, CFA7, Section 13.3 and in Volume 5 Appendix WR-02-007 of the main ES.

5.2.209 Table 8 includes the surface water features potentially affected by the AP₄ revised scheme.

Table 8: Surface water features potentially affected by the provision of a haul road through Uxbridge Golf Course

Water feature	Location description	Watercourse classification ⁷	Water Framework Directive (WFD) water body (water body number) and current overall status	WFD status objective (by 2027 as in River Basin Management Plan (RBMP) ⁸)	Receptor value ⁹
Grand Union Canal	Runs adjacent to TH175, and within 500m of TH171 and TH173.	Artificial	Grand Union Canal, Maple Lodge to Uxbridge (Rivers	Good potential (by 2015)	Very High

⁷ Water-feature classifications: Section 113 of the Water Resources Act 1991 defines a Main river as a watercourse that is shown as such on a Main river map. Section 72 of the Land Drainage Act 1991 defines an Ordinary watercourse as 'a watercourse that is not part of a Main river'. Section 221 of the Water Resources Act 1991 defines a watercourse as including 'all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. Main rivers are larger rivers and streams designated by Defra on the Main river map and are regulated by the Environment Agency.

⁸ Environment Agency (2009) River Basin Management Plan, Thames River Basin District

⁹ For examples of receptor value see Table 43 in the SMR addendum (Volume 5: Appendix CT-001-000/2 of main ES).

SES3 and AP4 ES Volume 2 – CFA7, Colne Valley

Water feature	Location description	Watercourse classification ⁷	Water Framework Directive (WFD) water body (water body number) and current overall status	WFD status objective (by 2027 as in River Basin Management Plan (RBMP) ⁸)	Receptor value ⁹
			Colne and Chess plus canal sections WFD water body reference: GB70610252 Moderate		
Fray's River	Branch of River Colne, runs adjacent to southern end of proposed haul road	Main river	Colne and Grand Union Canal (from confluence with Chess to Ash) WFD water body reference: GB106039023090 Poor	Good Potential	Very High
5 unnamed drains	Unnamed drains which cross golf course and feed into unnamed lakes	Ordinary watercourse	No status class in RBMP – assumed status (from Colne and Grand Union Canal – GB106039023090). Poor	No status class in RBMP – assumed status (from Colne and Grand Union Canal – GB106039023090). Good Potential	Moderate
6 unnamed lakes	To the west of the proposed haul road, potentially interconnected by drains	Lake	Not applicable	Not applicable	Moderate to High
Numerous small ponds		Pond	Not applicable	Not applicable	Moderate

5.2.210 The assessment has taken account of changes in relevant legislation since the main ES was produced, such as the Water Act 2014 and the Environmental Permitting (England and Wales) Regulations amendment 2014.

5.2.211 There are no licensed surface water abstractions within 1km of the AP4 revised scheme. There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.

5.2.212 The Environment Agency reports that there are seven current consented surface water discharges within 1km of the route in the study area (see Volume 5, Appendix WR-002-007 of the main ES).

5.2.213 A summary of the bedrock geology that outcrop in the area of this amendment is set out below, together with the hydrogeological classification for the formations:

- London Clay Formation – classified as Unproductive strata;

- Lambeth Group (Woolwich and Reading Formations) – classified as Secondary A aquifer, WFD waterbody Radlett Tertiaries, current status Poor, objective 2027 Good; and
- Cretaceous White Chalk Subgroup (including Seaford and Newhaven Chalk Formations (undifferentiated)) – classified as Principal aquifer, WFD waterbody Mid Chilterns Chalk, current status Poor, objective 2027 Good.

- 5.2.214 The bedrock is overlain by superficial deposits in the south and west of the land required for the amendment. The superficial deposits consist mainly of River Alluvium associated with the River Colne, and Black Park Gravel in the south of the area. In addition, Shepperton Gravel is exposed where Alluvium has been removed and is now largely covered by the lakes in the valley. Lynch Hill Gravel is also present in the west below the Alluvium. The Superficial deposits are classified as Secondary A aquifers.
- 5.2.215 Gravel deposits form a shallow aquifer across the valley floor and the lakes occur where these gravels have been excavated. Groundwater levels in the gravels are similar to the water levels in the lakes. Any potential wide scale changes to the groundwater levels and quality in the gravels may therefore affect surface water quality and levels, and vice versa.
- 5.2.216 The regional hydrogeological map data and available Environment Agency borehole monitoring data indicate that Chalk groundwater levels close to the Colne valley are from 30-37m above Ordnance Datum (AOD) in the south-east, rising to 40-60m AOD to the north-west. The map indicates that the regional direction of groundwater flow in the vicinity of the route is towards the south-east (i.e. crossing the valley floor in this area of the AP4 revised scheme). The data indicate that peak groundwater levels are below the lowest elevation of tunnels and cuttings in the study area, but are above the foundations of the viaduct. Other groundwater level data, such as the groundwater levels from South West Chilterns Groundwater Model¹⁰ and data provided by Affinity Water support this conclusion.
- 5.2.217 Groundwater level data show that there is some hydraulic connection between the superficial deposits, where present, and the underlying Chalk.
- 5.2.218 The London Borough of Hillingdon (LBH) reports¹¹ that there is an area of groundwater contamination in the Chalk aquifer associated with a closed landfill north of the route near Ickenham (see Map LQ-01-011, F1 to F4, Volume 5, Land Quality Map Book in main ES). Monitoring data for this area will be taken into account in the detailed design of the scheme.
- 5.2.219 There is one groundwater abstraction for PWS protected by SPZ in the area of the AP4 revised scheme. PWS TH174 is located to the north-east of the proposed haul road. The northern part of the haul road will cross the SPZ1 for PWS TH174.
- 5.2.220 The Environment Agency reports that there is one private licensed groundwater abstraction (GW42) within 1km of the AP4 revised scheme. The abstraction is from

¹⁰ Atkins (2007) South West Chilterns Phase 1 Conceptual Model Final Report. February 2007.

¹¹ London Borough of Hillingdon (2011) Environmental Protection Act 1990, Part 2A – Section 78B, Record of Determination of the Land at the Former Landfill Site at Newyears Green Lane, Harefield, Middlesex.

the Chalk and the haul road will cross the outer protection zone¹² for the abstraction. There are no reported unlicensed abstractions within 1km of the scheme. There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.

- 5.2.221 The Environment Agency reports that there is one consented discharge to ground/groundwater within 1km of the AP4 revised scheme (details in Map WR-02-007, Volume 5, Water Resources and Flood Risk Assessment Map Book in the main ES).
- 5.2.222 The haul road passes through Flood Zones 2 and 3 of the Frays River towards the southern extent of the road. The Environment Agency model of the River Colne provided to inform the main ES¹³ was used to determine maximum flood water levels in the Frays River, with water levels of 34.07m AOD and 34.73m AOD in the 1 in 100 year return period (1% annual probability) event including an allowance for climate change and 1 in 1000 year return period (0.1% annual probability) event respectively.
- 5.2.223 Comparison of the modelled flood water levels with the design long section indicates that the haul road passes through the area at risk of flooding in the 1 in 1000 year return period (0.1% annual probability). Receptors that have the potential to be affected by the proposed haul road are Uxbridge Golf Course (moderate value receptor) and unclassified open land. Since ground levels rise rapidly to the east of the haul road, flood risk to the urban area will not be affected by the proposed haul route.
- 5.2.224 The haul road crosses two areas shown on the updated Flood Map for Surface Water as being at risk of flooding in the 1 in 1000 year return period (0.1% annual probability) rainfall event. These are associated with dry valleys, discharging in a westerly direction to the Colne floodplain. The only receptor with the potential to be affected by the haul road is the Uxbridge Golf Course (moderate value receptor).
- 5.2.225 The various lakes situated along the Colne Valley are all at or below existing ground levels. Consequently there is no existing risk of flooding associated with them except in combination with flooding from the River Colne. The LBH Preliminary Flood Risk Assessment (PFRA) confirms that there is an increased potential for elevated groundwater along the valley of the River Colne within the borough. However, as described in the main ES (Volume 5: Appendix WR-003-007), small scale, above ground works are unlikely to affect the risk of flooding in the area from groundwater. According to the agreed data sets, there is no significant risk of flooding from sewers. These sources are therefore excluded from the assessment.

Future baseline

Construction (2017)

- 5.2.226 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to

¹² The inner protection zone of a private water abstraction is defined as the 50-day travel time from any point below the water table to the source with a minimum 50m-radius and is equivalent to a PWS SPZ1. The outer protection zone of a private water abstraction is defined by a 400-day travel time from a point below the water table and equivalent to SPZ2 at a PWS.

¹³ Halcrow Group (2010), Upper Colne SFRM Study (TH013 and TH031) Hydraulic Modelling and Mapping Final Technical Report.

those identified under the same reference number in the main ES and the SES and AP₂ ES.

- 5.2.227 None of the identified developments affect the assessment of the AP₄ amendment's impacts on water resources and flood risk assessment.
- 5.2.228 Current projections to the 2080s indicate that climate change may affect the future baseline against which the impacts of the AP₄ revised scheme on surface water and groundwater resources have been assessed. There may be changes in the flow and water quality characteristics of surface water and groundwater bodies as a result of changes in climate. However, these changes are not considered to result in changes to the level of significance of the effects reported in the main ES.
- 5.2.229 Further information on the potential additional impacts of climate change for water resources and flood risk assessment is provided in Sections 7 and 8 of Volume 1 and Table 13 of Volume 5: Appendix CT-009-000 of the main ES.

Operation (2026)

- 5.2.230 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.2.231 None of the identified developments affect the assessment of the AP₄ amendment's likely operational impacts on water resources and flood risk assessment.

Effects arising during construction

- 5.2.232 The proposed haul road will cross four small drains, comprising two drains which are not linked to watercourses in the catchment (to the north of the haul road), and two drains to the west of the haul road route, which are shown to connect to one of the unnamed lakes. These watercourses are not designated WFD water bodies and, as drains, are likely to be regularly maintained. During works for the culverting of the watercourses (and removal of culverts at the end of construction), there is potential for temporary adverse effects on water quality, for example from short term increases in sediment load. Mitigation measures set out in the draft CoCP, will control sediment mobilisation and risk of spills. As a result, the impact is assessed to be negligible, with neutral effect, which is not significant.
- 5.2.233 In addition, there is the potential for adverse effects on surface water quality from discharge from road run off. Design of the road drainage and discharge locations for this haul road are not yet complete, and there is a requirement for additional mitigation to address the potential water quality impacts on the receiving surface waterbody. Mitigation measures may include sustainable drainage systems (SuDS) balancing ponds, prior to discharge to watercourses. Without mitigation, the impact on these moderate to high-value receptors is assessed to be moderate, with a moderate effect. This is a new significant effect. Appropriate measures are expected to be brought forward either in a subsequent AP or by direct agreement with landowners.
- 5.2.234 The northern section of the land required for the haul road is located in SPZ₁ for PWS abstraction TH174. In this area, the haul road will be underlain by London Clay

Formation (classified as Unproductive strata) and the road will largely be constructed on embankment. Therefore, there is no pathway for any impact on the PWS TH174. Therefore, the impact on groundwater flow and groundwater quality at TH174 is assessed to be negligible with a neutral effect, which is not significant.

- 5.2.235 The north-west section of the haul road route will pass through the outer protection zone for the licensed private abstraction GW42. Abstraction is from the Chalk aquifer. In this area the haul road will be partially in cutting and will cross the outcrop of the Lambeth Group (secondary A aquifer) and Chalk (Principal aquifer). The bedrock is overlain by superficial deposits which are likely to be in hydraulic connection with the underlying aquifers. Construction of the haul road has the potential to impact on water quality at GW42 as a result of turbidity from ground disturbance. Since the haul route will pass on and through the superficial deposits, this will help to minimise the potential for increased turbidity in the Chalk. GW42 is used for mineral washing and as such any slight increase in turbidity is not considered to adversely affect the abstraction for this purpose. Therefore, whilst the groundwater abstraction is a high-value receptor, the impact on water quality is assessed to be minor, with moderate effect. This is a new significant effect. Monitoring of groundwater levels and quality will take place before, during and after construction. The monitoring data will be used to define appropriate mitigation, if required.
- 5.2.236 The haul road will result in the raising of ground that currently lies within the floodplain of the Fray's River. A section of haul road will result in potential obstruction and displacement of flood waters. There is therefore a requirement for additional mitigation to prevent the temporary structure from having an impact on the risk of flooding elsewhere. Although not yet designed, mitigation may include replacement floodplain storage (potentially alongside the proposed road to the south of the affected area) as well as flood relief culverts to provide conveyance across the road. Without mitigation, the impact on the moderate value receptor is assessed as being potentially moderate, resulting in a moderate effect, which is significant. Appropriate measures are expected to be brought forward either in a subsequent AP and reported in a future ES or by direct agreement with landowners. In accordance with section 16 of the draft CoCP, site specific flood risk management plan will be required prior to commencement of any temporary works, and a detailed strategy for provision of replacement floodplain storage will be developed at this time.
- 5.2.237 The haul road crosses two dry valleys that are shown on the updated Flood Map for Surface Water to be at risk of surface water flooding. Culverts will be required at these locations, to prevent surface water runoff from backing up to the west of the haul road.
- 5.2.238 The design of the haul road and any relevant watercourse crossings will be discussed with the Lead Local Flood Authority prior to the start of construction to ensure that there is no increase in flood risk.
- 5.2.239 Subject to the application of mitigation measures required by the CoCP, including preparation of site specific flood risk management plans, the assessment has identified no significant increase in flood risks from all sources during construction or reinstatement of land following removal of the haul road.

- 5.2.240 The haul road will give rise to a new significant effect to groundwater quality at the private abstraction GW42. This will change the level of significance of the effect on this receptor reported in the main ES from negligible to moderate.

Effects arising from operation

- 5.2.241 The haul road is temporary, and will be removed and the land restored before the end of construction. Therefore, the amendment will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES and SES and AP2 ES.

Mitigation and residual effects

- 5.2.242 The draft CoCP sets out the measures and standards of work which will be applied to the construction of the scheme (see Volume 5: Appendix CT-003-000 of the main ES). These will provide effective management and control of the impacts during the construction period.
- 5.2.243 To reduce potential impacts on flood risk, culverts will be provided for crossings of land drains. The culverts will be designed to convey at least the 1 in 100 years return period (1% annual probability) flood flow, including an allowance for climate change. This measure will ensure that flow is not reduced and continues to be conveyed to the downstream catchment, whilst also ensuring that the downstream flood risk is not increased.
- 5.2.244 The design of haul road drainage and flood risk mitigation is not yet complete. There is a requirement for additional mitigation to address the impacts on the receiving surface waterbody and flood risk. Mitigation may include SuDS and balancing ponds, prior to subsequent discharge to watercourses. With suitable mitigation in place the impact is expected to be negligible with neutral effect and therefore not significant. Mitigation for flood risk may include replacement floodplain storage areas and flood relief culverts. Appropriate measures are expected to be brought forward either in a subsequent AP and reported in a future ES or by direct agreement with landowners.
- 5.2.245 The AP4 revised scheme could give rise to a new significant adverse effect to groundwater quality at GW42. As a result, the programme of monitoring to be undertaken in the study area, prior to, during and following completion of the construction works, will be integrated with monitoring undertaken by the owners of GW42 to take account of the potential impact at the private abstraction. If further mitigation is required, it will comprise the provision of water from a PWS (with negligible impact), unless another supply option (also with negligible impact) is available. With suitable mitigation in place, if required, the impact is assessed to be negligible, with neutral effect and therefore not significant.
- 5.2.246 Generic examples of design measures that will mitigate impacts so that there will be no significant adverse effects on the quality and flow characteristics of surface watercourses and groundwater bodies during operation and management of the scheme are described in Volume 1, Section 9, and in the operation and maintenance plan for water resources and flood risk included in Volume 5 Appendix WR-001-000 of the main ES.

Cumulative effects

- 5.2.247 There are no new or different likely significant cumulative effects for water resources and flood risk as a result of the AP4 amendments interacting with one another, the AP1 amendments, AP2 amendments, or any relevant committed development.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.2.248 The haul road will result in new significant beneficial residual effects for NO₂ at receptors along Swakeleys Road, Lodore Green and The Drive.
- 5.2.249 The haul road will require land currently in use by Uxbridge Golf Course which will have a moderate adverse significant community effect on the operators and users of the course, which is a new residual significant effect.
- 5.2.250 The significant residual amenity effect reported for community in the main ES on the residents of the B467 Swakeleys Road will no longer occur.
- 5.2.251 The mitigation, compensation and enhancement measures described reduce the ecological effects arising from the AP4 revised scheme to a level that is not significant except for the following receptors:
- permanent loss of 0.3ha of wet grassland and 0.1ha of other mixed habitat within Fray's Farm Meadow SSSI. In addition a further 0.9ha of the habitat within the SSSI will be temporarily impacted by increased NO_x concentrations. Together these impacts result in a temporary adverse residual effect on the integrity of the site. This is a new residual effect significant at the national level;
 - the direct loss of 0.3ha from one of the largest remaining areas of unimproved wet grassland in Greater London, resulting in a permanent adverse residual effect on the conservation status of this habitat. This is a new residual effect significant at the national level; and
 - construction of the haul road, will lead to increased NO_x concentrations and dust deposition on ancient woodland at Pinnock Wood, resulting in a significant temporary adverse residual effect on the conservation status of this habitat for approximately 9 years. This is a new residual effect significant at the national level.
- 5.2.252 The AP4 amendment will give rise to a different significant effect on the Colne Valley LCA during construction but will not change the level of significance of the residual effects reported in the main ES (moderate adverse).
- 5.2.253 The amendment will give rise to a moderate adverse significant residual effect during construction on a new receptor: Viewpoint AP4.049.2.008: view south and west from The Drive and Georgian Close.
- 5.2.254 Noise from specific construction activities for the haul road has been identified as resulting in a significant residual temporary effect on Fairways Carvery Restaurant, a non-residential receptor.

- 5.2.255 The AP4 amendment will result in the removal of the likely residual significant noise effects arising from construction traffic on Harvil Road and B467 Swakeleys Road identified in the main ES.
- 5.2.256 There will be a new minor adverse residual significant effect on traffic related severance for non-motorised users at the intersection of the new haul road and Footpath U50.
- 5.2.257 There is a requirement for additional mitigation to address the impacts on the receiving surface waterbody and flood risk. Mitigation may include SuDS balancing ponds, prior to subsequent discharge to watercourses, as well as replacement floodplain storage areas and flood relief culverts. Appropriate measures are expected to be brought forward either in a subsequent AP and reported in a future ES or by direct agreement with landowners.
- 5.2.258 The amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any other topic.

5.3 Additional land required for access to Denham Water Ski Club (AP4-007-001)

- 5.3.1 The Bill provides for an access road to enable construction of the piers for the Colne Valley viaduct. Construction would require land to the north-east of the A412 Denham Way/North Orbital Road, off which the Denham Water Ski Club is accessed. The construction works would be undertaken to enable access can continue to the water ski club through the implementation of traffic management measures. The nearby jetty used to construct the Colne Valley viaduct would require a small amount of land that forms part of the car park for the club. However, any impact on the capacity and operation of the car park would be avoided through the configuration of the compound and its fencing. The Bill also provides for the permanent provision of landscape mitigation planting on an area currently used by members of the club for recreation (see map CT-05-021 and CT-06-021 in main ES, Volume 2, CFA7 Map Book).
- 5.3.2 Since submission of the Bill, the need for changes has been identified to further reduce the impact on the club. The access for construction of the scheme will be moved closer to the Colne Valley viaduct to ensure that it is perpendicular to the access road to the club's facilities. This will enable crossing controls to be installed during construction and for the club's access road to remain open. An alternative temporary access road to the club will also be provided. This will be used when the construction access route cannot be crossed, for example, when the viaduct is being constructed overhead. The alternative access road will link with an existing access road used by a utility provider to the north of the club's current access road. The access road will also be used permanently during HS2 operations for access to a balancing pond.
- 5.3.3 The amendment also includes the following provisions (see maps CT-05-021 and CT-06-021 in the SES3 and AP4 ES Volume 2, CFA7 Map Book):
- the installation of a grass reinforcement mesh in a section of grassland adjacent to the club house, which will act as an overflow car park during construction and additional parking during operation of the scheme;

- the balancing pond south of the club house will be replaced by a drainage ditch to reduce incursion into a grassland area used by club members for recreation; and
- a small (150m²) section of landscape planting will also be removed from the AP4 revised scheme. The land will be reinstated to its existing condition following construction, increasing the amount of land available to club members for recreation.

- 5.3.4 The changed access arrangements are expected to take approximately one month to complete. The changed access arrangements will be constructed during construction of Colne Valley viaduct section 3, which is planned to commence in autumn 2018 and will take approximately two years and nine months to complete, as reported in the main ES (Volume 2, CFA7). Approximately 0.2ha of land outside the original limits of the Bill is required, hence the need for this amendment.
- 5.3.5 The access change for the Denham Water Ski Club is not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: agriculture, forestry and soils; air quality; community; land quality; landscape and visual assessment; socio-economics; sound, noise and vibration; traffic and transport; and water resources and flood risk assessment. However there were changes where reassessment was considered to be required in respect of cultural heritage and ecology.

Cultural heritage

Introduction

- 5.3.6 This section of the report describes the environmental baseline in relation to cultural heritage that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.3.7 The assessment scope, key assumptions and limitations for cultural heritage are as set out in in Volume 1, the SMR (Volume 5: Appendix CT-001 -000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.

Existing baseline

- 5.3.8 The cultural heritage baseline for the assessment takes into account information collected for the main ES, which included walk-over survey, geophysical survey, remote-sensing data, and data from national and local registers. A full list is provided in Volume 2, Section 6.3 of the main ES, updated in the SES and AP2 ES.
- 5.3.9 The land required for the access to Denham Water Ski Club does not encroach on any heritage assets. Northmoor Hill Wood (asset reference CVA052), an area of ancient woodland, lies 115m to the south-west of the access. It is an asset of high heritage value. However, its setting does not contribute to this value. Some 276m to the north-west of the access is the site of a 19th century garden at Durdent Court (asset reference CVA073). This is an asset of low heritage value.

Future baseline

Construction (2017)

- 5.3.10 The future baseline for construction in 2017 remains unchanged from that reported in the main ES and SES and AP₂ ES.

Operation (2026)

- 5.3.11 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.3.12 None of the identified developments affect the assessment of the AP₄ revised scheme's likely operational impacts on cultural heritage.

Effects arising during construction

- 5.3.13 No significant construction effects were reported in the main ES in regard to the access arrangements to Denham Water Ski Club. The land required for the revised access does not encroach on any identified heritage assets or their setting.
- 5.3.14 The access for Denham Water Ski Club will not give rise to a new or different significant effect on cultural heritage during construction and will not change the level of significance of the effects reported in the main ES.

Effects arising from operation

- 5.3.15 No significant operation effects were reported in the main ES in regard to the access arrangements to Denham Water Ski Club. The land required for the revised access does not encroach on any identified heritage assets or their setting.
- 5.3.16 The access for Denham Water Ski Club will not give rise to a new or different significant effect on cultural heritage during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.3.17 There will be no change to the mitigation and residual effects reported in Volume 2 of the main ES.

Cumulative effects

- 5.3.18 There are no new or different likely significant cumulative effects for cultural heritage as a result of the amendment acting in combination with another amendment in AP₄, or as a result of any relevant committed development interacting with the AP₄ revised scheme.

Ecology

Introduction

- 5.3.19 This section of the report describes the environmental baseline in relation to ecology that is relevant to the assessment. It then identifies any new or different likely

significant environmental effects as a result of the amendment, compared to those of the SES₃ scheme.

Scope, assumptions and limitations

- 5.3.20 Updates to the scope of the assessment for ecology are set out in Volume 1 of SES₃ and AP₄ ES. The key assumptions and limitations, and the methodology for determining significance of effects are as set out in Volume 1, the SMR and the SMR Addendum (Volume 5: Appendix CT-001-000/1 and CT-001-000/2) of the main ES and in Addendum 4 to the SMR (SES₃ and AP₄ ES Volume 5: Appendix CT-001-000/5).
- 5.3.21 To address any limitations in data, a precautionary baseline has been considered according to the guidance reported in the main ES, Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst-case' basis for the subsequent assessment. The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the AP₄ revised scheme.
- 5.3.22 Existing baseline
- 5.3.23 The ecological baseline of the land required for the amendment has been based on: field data collated for the main ES and the SES and AP₂ ES; additional survey work for badgers, undertaken from April 2015 to June 2015; aerial photography; and relevant existing information gathered from national organisations and from regional and local sources including: Buckinghamshire and Milton Keynes Environmental Records Centre; Herts and Middlesex Wildlife Trust; Hertfordshire Biological Records Centre; and Greenspace Information for Great London.
- 5.3.24 A summary of the baseline information relevant to the assessment of the amendment is provided below. This takes account of any relevant 2015 survey information provided in SES₃ and AP₄ ES, Volume 5, Appendix EC-001-002. For those receptors described in the main ES, further details are provided in Volume 2, CFA7, Section 7.3 and in Volume 5, including maps EC-01 to EC-12 of the main ES.

Designated sites

- 5.3.25 There are two statutory designated sites for nature conservation relevant to the assessment of the construction of the temporary alternative access road:
- Mid Colne Valley SSSI (141ha) is designated for woodland habitat, including ancient woodland, a diverse assemblage of breeding birds associated with woodland and wetland and for wintering wildfowl. It is of national value, as reported in the main ES. The land required for this amendment is within the SSSI; and
 - Northmoor Hill Wood LNR (8.7ha) is approximately 250m south of the land required for the amendment and is designated for ancient woodland. It is of district/borough value, as reported in the main ES.
- 5.3.26 There are five non-statutory designated sites for nature conservation relevant to the assessment of the construction of the temporary alternative access road. All are of county/metropolitan value, as reported in the main ES:
- Mid Colne Valley SMI (321ha) is approximately 250m east of the land required

for the amendment. It is designated for riparian habitat with a diverse assemblage of aquatic and wetland plants, species-rich grassland and wet woodland. It is also designated for breeding and wintering water birds, invertebrates, water voles and harvest mice;

- Northmoor Hill Wood and Wyatt's Covert Local Wildlife Site (LWS) (13.1ha) is approximately 30m south-west of the land required for the amendment and is designated for ancient woodland. It has oak, ash and birch woodland in the drier, more acidic areas and beech and alder woodland in the low-lying, wetter areas (some of which are spring-fed);
- Great Halings Wood LWS (9.5ha) is approximately 400m west of the land required for the amendment and is designated for ancient woodland that is relatively species-rich and dominated by mature beech and hazel coppice;
- Tilehouse Gravel Pits Biological Notification Site (BNS) (26ha) is partially within the Mid Colne Valley SSSI and within the land required for the amendment. It is designated for standing water, wetland vegetation and water birds; and
- Colne Valley Gravel Pits Hertfordshire LWS (114ha) is approximately 350m north-east of the land required for the amendment and is designated for wintering birds and wetland habitats. It includes several lakes north of the Mid Colne Valley SSSI.

5.3.27 In addition to the ancient woodland within the designated sites, there are two areas of ancient woodland have been added to the ancient woodland inventory by Natural England since submission of the main ES, as reported in the SES and AP2 ES. A small (0.26ha) unnamed woodland is located approximately 500m north-west of Ranston Covert and Battlesford Wood. There is also one small woodland area (0.6ha) that is part of Great Halings Wood. They are located approximately 100m and 350m west of the land required for the amendment, respectively.

5.3.28 Statutory and non-statutory designated sites for nature conservation within the wider study area are described in the main ES, Volume 2, CFA7, Section 7 and are shown on EC-01-011 to EC-01-013a, Volume 5, Ecology Map Book.

Habitats

5.3.29 The main ES reports that the broadleaved woodland around many of the lakes in the Mid Colne Valley SSSI is dominated by willow and alder with frequent sycamore and oak that is likely to qualify as wet woodland, a habitat of principal importance. This type of woodland is frequent in the River Colne valley and is of district/borough value, as reported in the main ES. Approximately 0.1ha of this woodland habitat is present within the land required for the temporary alternative access road.

5.3.30 Other habitats required for the amendment include approximately 0.2ha of broadleaved scattered trees (for the construction of the temporary alternative access road) and approximately 0.2ha of amenity grassland (for land required for the temporary installation of a grass reinforcement mesh adjacent to the clubhouse). Neither habitat type is of more than local/parish value, as reported in the main ES.

- 5.3.31 Habitats surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3 and are shown on Maps EC-02-021b to EC-02-025a, Volume 5, Ecology Map Book.

Protected and/or notable species

- 5.3.32 The assemblage of breeding birds associated with habitats in the Mid Colne Valley SSSI is relevant to this amendment. It is of high species diversity and several species are present in numbers above 1% of the county population including gadwall, kingfisher and Cetti's warbler. This assemblage is a reason for designation for the Mid Colne Valley SSSI and, as such, is of national value, as reported in the main ES.
- 5.3.33 The assemblage of 12 species of bat identified in the main ES as associated with woodland, river and standing water habitat within and adjacent to the Mid Colne Valley SSSI is relevant to this amendment. This assemblage is of up to regional value, as reported in the main ES.
- 5.3.34 The main ES reports that a population of otter is present along the River Colne and likely to use habitats around several of the lakes in this area. No otter holts have been recorded; however, the field signs indicate that otters use the watercourses and water bodies for foraging and commuting. Otter may use terrestrial habitats within and adjacent to the land required for the amendment and are therefore relevant to the assessment. The otter population is of up to county/metropolitan value.
- 5.3.35 The main ES reports that a population of grass snake associated with habitat at Northmoor Pumping Station (which is adjacent to the land required for the amendment) is of up to local/parish value.
- 5.3.36 Species identified within the area surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3. Locations of species records are shown on Maps EC-04 to EC-12, Volume 5, Ecology Map Book.

Future baseline

Construction (2017)

- 5.3.37 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.3.38 None of the identified developments affect the assessment of the amendment's likely construction impacts on ecology.

Operation (2026)

- 5.3.39 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.3.40 None of the identified developments affect the assessment of amendment's likely operational impacts on ecology.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.41 The assessment assumes implementation of the measures set out within the draft CoCP (Volume 5: Appendix CT-003-000 of the main ES), which includes translocation of protected species where appropriate.

Designated sites

- 5.3.42 Part 1 of the SES and AP₂ ES concludes that construction of the SES scheme will result in a permanent adverse effect on the integrity of the Mid Colne Valley SSSI that is significant at the national level. Construction of the temporary alternative access road to Denham Water Ski Club will result in approximately 0.1ha of additional woodland habitat loss, and consequently loss of breeding bird habitat, both of which are reasons for designation. However, this represents a small additional proportion (less than 0.1%) of the Mid Colne Valley SSSI. This small scale loss of additional woodland and breeding bird habitat will not give rise to new or different significant effects on the integrity of the Mid Colne Valley SSSI and will not change the level of significance of the effects reported in the main ES.
- 5.3.43 The main ES reports that disturbance to birds using Tilehouse Gravel Pits BNS as a result of habitat loss during construction of the original scheme will result in a permanent effect on the integrity of the site that is significant at the county/metropolitan level. Construction of the temporary alternative access road to Denham Water Ski Club will result in approximately 0.1ha of additional woodland habitat loss. This habitat is not a primary reason for designation and represents a small additional proportion (less than 0.4%) of the BNS. The amendment will not give rise to new or different significant effects on the integrity of Tilehouse Gravel Pits BNS and will not change the level of significance of the effects reported in the main ES.
- 5.3.44 No new or different significant effects on other designated sites will occur.

Habitats

- 5.3.45 The main ES reports that the loss of broadleaved woodland within land required for construction of the original scheme will result in a permanent adverse effect on the conservation status of woodland in the Mid Colne Valley SSSI that is significant at the county/metropolitan level. The small scale loss of 0.1ha of additional broadleaved woodland habitat for construction of the temporary alternative access road will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES.
- 5.3.46 It is unlikely that the amendment will result in any new or different effects on habitat receptors of relevance at more than the local/parish level. Local/parish level effects which are in addition to those identified in the main ES and the SES and AP₂ ES are listed in Volume 5: Appendix EC-003-002 of the SES₃ and AP₄ ES.

Protected and/or notable species

- 5.3.47 The main ES identifies that construction of the original scheme will result in the loss of breeding bird habitat and disturbance of breeding birds in the Mid Colne Valley SSSI and Mid Colne Valley SMI, which will reduce the numbers of several species of bird

during the five year construction period. However, it is not expected that this will affect the conservation status of the overall breeding bird assemblage because woodland and wetland habitats are abundant in the wider landscape.

- 5-3-48 The main ES reports that the loss of an otter holt could result in an adverse effect on conservation status that would be significant at up to the county/metropolitan level.
- 5-3-49 The main ES identifies that loss of bat commuting and foraging habitat within the land required for the construction of the original scheme may require some bats to travel further and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects alone are for all species considered unlikely to result in sufficient disturbance of the populations concerned to result in an adverse effect on their conservation status.
- 5-3-50 The construction of the temporary access road to Denham Water Ski Club will result in the loss of approximately 0.1ha of woodland habitat that is suitable for breeding birds, foraging bats and as terrestrial habitat for otters. However, there are no known bat roosts or confirmed otter holts within the 0.1ha of woodland habitat to be lost, and this loss represents a small proportion of a large resource of habitats likely to be used by these species in this area. Therefore, the amendment will not generate any new or different significant effects, or change the level of significance of effects reported in the main ES.

Cumulative effects

- 5-3-51 This amendment will require removal of 0.1ha of broadleaved woodland habitat from the Mid Colne Valley SSSI and Tilehouse Gravel Pits BNS, and a further 0.2ha will be removed to accommodate alternative outfall locations for land and track drainage discharge (AP4-007-002). Due to the large extent of the sites and the small proportional area of loss from both of these sites (less than 0.2% of the SSSI and less than 1% of the BNS) no significant cumulative effects are likely.

Mitigation and residual effects

Other mitigation measures

- 5-3-52 Large areas of compensatory woodland, approximately 20ha, are provided in CFA7 as reported in the main ES. Based on the small proportion of the additional broadleaved woodland habitat lost (approximately 0.1ha), no additional mitigation measures (i.e. in addition to those identified in the main ES) are required.

Summary of likely residual significant effects

- 5-3-53 No new or different significant residual effects on ecological receptors occur as a consequence of the amendment. The significant residual effects of the AP4 revised scheme in this area are therefore unchanged from those reported in the main ES.

Effects arising from operation

- 5-3-54 The construction of the temporary alternative access road to Denham Water Ski Club will not give rise to new or different significant effects on ecology during operation and will not change the level of significance of the effects reported in the main ES.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.3.55 The amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any environmental topic.

5.4 Additional land required for track drainage discharge in the Colne Valley (AP4-007-002)

- 5.4.1 The Bill provides for an existing buried culvert, assumed to be to the south of Waybeards Cottages approximately on the alignment of an Affinity Water access track, to be used to convey track drainage from the Colne Valley viaduct to the River Colne (see map CT-05-021 and CT-06-021 in main ES, Volume 2, CFA7 Map Book).
- 5.4.2 Since submission of the Bill, it has been identified that additional land is required permanently along the length of the existing culvert (approximately 0.4km) to allow the culvert and the existing outfalls to be modified or upgraded as necessary following more detailed site investigation (see maps CT-05-021 and CT-06-021 in the SES3 and AP4 ES Volume 2, CFA7 Map Book).
- 5.4.3 The works are expected to take approximately one month to complete. The track drainage discharge will be constructed during construction of Colne Valley viaduct section 3, which is planned to commence in autumn 2018 and will take approximately two years and nine months to complete, as reported in the main ES (Volume 2, CFA7). Approximately 0.25ha of land outside the original limits of the Bill is required, hence the need for this amendment.
- 5.4.4 The additional land required for track drainage discharge in the Colne Valley is not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: agriculture, forestry and soils; air quality; community; land quality; landscape and visual assessment; socio-economics; sound, noise and vibration; traffic and transport; and water resources and flood risk assessment. However there were changes where reassessment was considered to be required in respect of cultural heritage and ecology.

Cultural heritage

Introduction

- 5.4.5 This section of the report describes the environmental baseline in relation to cultural heritage that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.4.6 The assessment scope, key assumptions and limitations for cultural heritage are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001 -000/01) and the SMR Addendum (Volume 5: Appendix CT-001-000/02) of the main ES.

Existing baseline

- 5.4.7 The cultural heritage baseline for the assessment takes into account information collected for the main ES, which included walk-over survey, geophysical survey,

remote-sensing data, and data from national and local registers. A full list is provided in Volume 2, Section 6.3 of the main ES updated in the SES and AP2 ES.

- 5.4.8 The land required for the track drainage does not encroach on any heritage assets. Northmoor Hill Wood (asset reference CVA052), an area of ancient woodland lies 380m to the south-west of the land required at its nearest point. It is an asset of high heritage value. However, its setting does not contribute to this value. Some 466m to the west of the land required is the site of a 19th century garden at Durdent Court (asset reference CVA073). This is an asset of low heritage value.

Future baseline

Construction (2017)

- 5.4.9 The future baseline for construction in 2017 remains unchanged from that reported in the main ES (Volume 5: Appendix CT-004-000).

Operation (2026)

- 5.4.10 Volume 5: Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.4.11 None of the identified developments affect the assessment of the AP4 revised scheme's likely operational impacts on cultural heritage.

Effects arising during construction

- 5.4.12 No significant construction effects were reported in the main ES in regard to the track drainage arrangements. The land required for the revised land and track drainage does not encroach on any identified heritage assets or their setting.
- 5.4.13 The additional land required for track drainage discharge in the Colne Valley will not give rise to a new or different significant effect on cultural heritage during construction and will not change the level of significance of the effects reported in the main ES.

Effects arising from operation

- 5.4.14 No significant operational effects were reported in the main ES in regard to the land and track drainage arrangements. The land required for the revised land and track drainage does not encroach on any identified heritage assets or their setting.
- 5.4.15 The revised land and track drainage will not give rise to a new or different significant effect on cultural heritage during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.4.16 There will be no change to the mitigation and residual effects reported in Volume 2 of the main ES.

Cumulative effects

- 5.4.17 There are no new or different likely significant cumulative effects for cultural heritage as a result of the amendment acting in combination with another amendment in AP4, or in AP1 and AP2, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Ecology

Introduction

- 5.4.18 This section of the report describes the environmental baseline in relation to ecology that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.4.19 Updates to the scope of the assessment for ecology are as set out in Volume 1 of SES3 and AP4 ES. The key assumptions and limitations, and the methodology for determining significance of effects are as set out in Volume 1, the SMR and the SMR Addendum (Volume 5: Appendix CT-001-000/1 and CT-001-000/2) of the main ES and in Addendum 4 to the SMR (SES3 and AP4 ES Volume 5: Appendix CT-001-000/5).
- 5.4.20 To address any limitations in data, a precautionary baseline has been considered according to the guidance reported in the main ES, Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst-case' basis for the subsequent assessment. The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the AP4 revised scheme.

Existing baseline

- 5.4.21 The ecological baseline of the land required for the amendment has been based on: field data collated for the main ES and SES and AP2 ES; aerial photography; and relevant existing information gathered from national organisations and from regional and local sources including: Buckinghamshire and Milton Keynes Environmental Records Centre; Herts and Middlesex Wildlife Trust; Hertfordshire Biological Records Centre; and Greenspace Information for Greater London.
- 5.4.22 A summary of the baseline information relevant to the assessment of the amendment is provided below. This takes account of any relevant 2015 survey information provided in SES3 and AP4 ES, Volume 5, Appendix EC-001-002. For those receptors described in the main ES, further details are provided in Volume 2, CFA7, Section 7.3 and in Volume 5, including maps EC-01 to EC-12 of the main ES.

Designated sites

- 5.4.23 The land required to accommodate alternative outfall locations for land and track drainage discharge is partially within the Mid Colne Valley SSSI (141ha), which is of national value, as reported in the main ES. The reason for designation is detailed in the ecological baseline section for amendment AP4-007-001 (Section 5.3).
- 5.4.24 There are five non-statutory designated sites for nature conservation relevant to the assessment of the amendment. The reasons for their designation are detailed in the

ecological baseline section of AP4-007-001 (Section 5.3). All are of county/metropolitan value, as reported in the main ES.

- Mid Colne Valley SMI (321ha) is approximately 10m east of the land required for the amendment;
- Northmoor Hill Wood and Wyatt's Covert LWS (13.1ha) is approximately 175m south of the land required for the amendment;
- Great Halings Wood LWS (9.5ha) is approximately 350m west of the land required for the amendment;
- Tilehouse Gravel Pits BNS (26ha) is partially within the Mid Colne Valley SSSI. The land required for the amendment is partially within the BNS; and
- Colne Valley Gravel Pits Hertfordshire LWS (114ha) is approximately 175m north of the land required for the amendment.

5.4.25 Two additional areas of ancient woodland, one to the east of Great Halings Wood and one to the north of Wyatt's Covert, have also been added to the ancient woodland inventory by Natural England since the main ES. They are located approximately 300m and 100m west of the land required for the amendment, respectively. This ancient woodland represents an irreplaceable resource.

5.4.26 Statutory and non-statutory designated sites for nature conservation within the wider study area are described in the main ES, Volume 2, CFA7, Section 7 and are shown on EC-01-011 to EC-01-013a, Volume 5, Ecology Map Book.

Habitats

5.4.27 The main ES reports that the River Colne is a habitat of principal importance as assessed by the Joint Nature Conservation Committee (JNCC)¹⁴. Owing to its size, its distinctive assemblages of river species and the fact that it forms an integral part of several designated nature conservation sites (the Mid Colne Valley SSSI and the Mid Colne Valley SMI) it is of county/metropolitan value. The River Colne is directly adjacent to land required for the amendment.

5.4.28 The main ES reports that the broadleaved woodland in this area is likely to qualify as wet woodland, which is a habitat of principal importance. This type of woodland is frequent in the River Colne valley and is of district/borough value. Approximately 0.25ha of this woodland habitat is present within the land required for the amendment.

5.4.29 Other habitats present within the land required for the amendment include tall ruderal vegetation, scrub and amenity grassland. As reported in the main ES, none of these habitats are of greater than local/parish value.

Protected and/or notable species

5.4.30 The assemblage of breeding birds associated with habitats in the Mid Colne Valley SSSI is relevant to this amendment. This assemblage is a reason for designation for

¹⁴ JNCC (2011) UK BAP Rivers – Qualifying Reaches. Available online at: <http://jncc.defra.gov.uk/page-4863>.

the Mid Colne Valley SSSI and, as such, is of national value, as reported in the main ES.

- 5.4.31 The assemblage of 12 species of bat identified in the main ES as associated with woodland, river and standing water habitat within and adjacent to the Mid Colne Valley SSSI is relevant to this amendment. This assemblage is of up to regional value as reported in the main ES.
- 5.4.32 The main ES reports that a population of otter is present along the River Colne and likely to use habitats around several of the lakes in this area. No otter holts have been recorded, but the field signs indicate that otters use the watercourses and waterbodies for foraging and commuting. Otters may be using terrestrial habitats within and adjacent to the land required to accommodate alternative outfall locations for land and track drainage discharge and are therefore relevant to the assessment. The otter population is of up to county/metropolitan value.
- 5.4.33 The population of grass snake associated with habitat at Northmoor Pumping Station, reported in the main ES, located to the north of Tilehouse Lake South is within the land required to accommodate alternative outfall locations for land and track drainage discharge. Other reptiles may also be present in suitable habitat within the land required for the amendment. The reptile assemblage is of up to local/parish value.
- 5.4.34 Species identified within the area surrounding the land required for the amendment are described in the main ES, Volume 2, CFA7, Section 7.3. Locations of species records are shown on Maps EC-04 to EC-12, Volume 5, Ecology Map Book, in the main ES.

Future baseline

Construction (2017)

- 5.4.35 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.4.36 None of the identified developments affect the assessment of the likely construction impacts of the AP₄ revised scheme on ecology.

Operation (2026)

- 5.4.37 Volume 5: Appendix CT-004-000 of the SES₃ and AP₄ ES provides details of the developments which are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP₂ ES.
- 5.4.38 None of the identified developments affect the assessment of the AP₄ revised scheme's likely operational impacts on ecology.

Effects arising during construction

Avoidance and mitigation measures

- 5.4.39 The assessment assumes implementation of the measures set out within the draft CoCP (Volume 5: Appendix CT-003-000 of the main ES), which includes translocation of protected species where appropriate.

Designated sites

- 5.4.40 Part 1 of the SES and AP₂ ES concludes that construction of the SES scheme will result in a permanent adverse effect on the integrity of the Mid Colne Valley SSSI that is significant at the national level. The land required for land and track drainage discharge will result in approximately 0.2ha additional woodland habitat loss from the SSSI. However, this represents a small additional proportion (0.1 %) of the Mid Colne Valley SSSI. Therefore, this small scale loss of additional woodland and breeding bird habitat will not give rise to new or different significant effects on the integrity of the Mid Colne Valley SSSI and will not change the level of significance of the effects reported in Part 1 of the SES and AP₂ ES.
- 5.4.41 The main ES reports that disturbance to birds using Tilehouse Gravel Pits BNS as a result of habitat loss during construction will result in a permanent effect on the integrity of the site that is significant at the county/metropolitan level. The area required for land and track drainage discharge will result in approximately 0.2ha of additional woodland habitat loss. This habitat is not a primary reason for designation and represents a small additional proportion (0.6%) of the BNS. Therefore, the amendment will not give rise to new or different significant effects on the integrity of Tilehouse Gravel Pits BNS and will not change the level of significance of the effects reported in the main ES.
- 5.4.42 No other new or different significant effects on designated sites will occur.

Habitats

- 5.4.43 The main ES reports that the original scheme will result in a permanent adverse effect on the conservation status of woodland in the Mid Colne Valley SSSI that is significant at the county/metropolitan level. The small scale loss of 0.2ha of additional broadleaved woodland habitat required for land and track drainage discharge is unlikely to adversely affect its conservation status. Therefore, the amendment will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in the main ES.
- 5.4.44 It is unlikely that the amendment will result in any new or different effects on habitat receptors of relevance at more than the local/parish level. Local/parish level effects which are in addition to those identified in the main ES and the SES and AP₂ ES are listed in Volume 5: Appendix EC-003-002 of the SES₃ and AP₄ ES.

Protected and/or notable species

- 5.4.45 The use of land will result in the loss of approximately 0.2ha of broadleaved woodland habitat that is suitable for breeding birds, foraging bats and as terrestrial habitat for otters. However, there are no known bat roosts or confirmed otter holts within the 0.2ha of woodland habitat to be lost, and this loss represents a small proportion of a

large resource of habitats likely to be used by these species in this area. Therefore, the amendment will not generate any new or different significant effects, or change the level of significance of effects reported in the main ES.

Cumulative effects

- 5.4.46 This amendment together with the construction of the temporary alternative access road to Denham Water Ski Club (AP4-007-001) will require removal of approximately 0.3ha of broadleaved woodland from the Mid Colne Valley SSSI and Tilehouse Gravel Pits BNS. Due to the large extent of the sites and the small proportional area of loss from both of these sites (less than 0.2% of the SSSI and less than 1.2% of the BNS) no significant cumulative effects are likely.

Mitigation and residual effects

Other mitigation measures

- 5.4.47 Large areas of compensatory woodland, approximately 19.5ha, are provided in CFA7 as reported in the main ES. Based on the small proportion of the additional broadleaved woodland habitat lost (approximately 0.2ha), no additional mitigation measures (i.e. in addition to those identified in the main ES) are required.

Summary of likely residual significant effects

- 5.4.48 No new or different significant residual effects on ecological receptors occur as a consequence of the amendment. The significant residual effects of the AP4 revised scheme in this area are therefore unchanged from those reported in the main ES.

Effects arising from operation

- 5.4.49 The land required to accommodate alternative outfall locations for land and track drainage discharge will not give rise to new or different significant effects on ecology during operation and will not change the level of significance of the effects reported in the main ES.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.4.50 The amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any environmental topic.

5.5 Additional land required for the temporary provision of turbidity treatment equipment in the Colne Valley (AP4-007-003)

- 5.5.1 The Bill provides for potential mitigation options to treat abstractions of the PWS affected by turbidity as a consequence of tunnelling and piling impacts on groundwater resources.
- 5.5.2 Since the submission of the Bill, the requirement to treat abstracted groundwater at Mill End, Springwell Lake and West Hyde pumping stations has been identified. Additional temporary land is required for these three locations to accommodate the turbidity treatment equipment. The pumping stations at Mill End and Springwell are unlikely to be affected by construction of the scheme. However, treatment of

groundwater at these locations will increase the amount of water they supply, which is currently limited due to natural water quality constraints. These increased amounts will offset reductions from pumping stations close to the scheme that will be affected by construction activity. West Hyde is also considered unlikely to be affected by the construction of the scheme. However, additional powers for temporary land acquisition are required on a precautionary basis to ensure that should any adverse impacts be identified, appropriate mitigation can quickly be implemented.

- 5.5.3 The turbidity treatment equipment will be located within the curtilage of the existing pumping stations on a concrete pad (see maps CT-05-022-R1 and CT-05-022-R2 in the SES3 and AP4 ES, Volume 2, CFA7 Map Book). The equipment will connect with existing abstraction and discharge points present within the existing pumping station facilities and will be installed on existing hardstanding. There will be no change to the existing site drainage.
- 5.5.4 If backwashing of temporary filters is required during their operation, the backwash will either be discharged to sewer or will be tankered to a suitable disposal point.
- 5.5.5 Approximately 3ha of additional land is required temporarily for the turbidity treatment equipment. The additional land needed to meet this requirement is outside the limits of the Bill, hence the need for this amendment.
- 5.5.6 The installation of additional turbidity treatment equipment is not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: agriculture, forestry and soils; air quality; community; cultural heritage; ecology; land quality; landscape and visual assessment; socio-economics; and traffic and transport. However, there were changes where reassessment was considered to be required in respect of: sound, noise and vibration; and water resources and flood risk assessment.

Sound, noise and vibration

Introduction

- 5.5.7 This section of the report describes the environmental baseline in relation to sound, noise and vibration that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.5.8 The assessment scope, key assumptions and limitations for sound, noise and vibration are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.
- 5.5.9 Local assumptions and limitations for sound, noise and vibration are set out in main ES Volume 2, CFA7, Section 11.

Existing baseline

- 5.5.10 The baseline sound, noise and vibration information for CFA7 is described in the main ES (Volume 2, CFA7, Section 11.2). Baseline sound levels representative of the assessment locations affected by this amendment have been used in the construction sound, noise and vibration assessments.

Future baseline

Construction (2017)

- 5.5.11 The future baseline for construction in 2017, and construction traffic in 2021, remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Operation (2026)

- 5.5.12 The future baseline for operation in 2026 remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 11.2).

Effects arising during construction

- 5.5.13 It is assumed that noise and vibration from the turbidity pumps that are to be installed at Mill End, Springwell and West Hyde will be controlled through their design, the specification of noise and vibration emission requirements and the provision of enclosures or barriers as appropriate to avoid significant adverse noise and vibration effects at nearby dwellings. The amendment will therefore not give rise to any new or different significant construction noise or vibration effects.

Effects arising from operation

- 5.5.14 As the amendment is during the construction phase only, the amendment will not give rise to a new or different significant operational noise or vibration effect in comparison with those reported in the main ES.

Mitigation and residual effects

- 5.5.15 The assessment of construction noise and vibration assumes the implementation of the principles and management processes set out in the draft CoCP (Volume 5: Appendix CT-003-000).
- 5.5.16 No additional mitigation is considered necessary as a result of the amendment.

Cumulative effects

- 5.5.17 This assessment has considered the potential cumulative construction noise effects of the scheme and other committed developments.
- 5.5.18 There are no new or different likely significant cumulative effects for sound, noise and vibration as a result of the amendment acting in combination with another amendment in AP4, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Water resources and flood risk assessment

Introduction

- 5.5.19 This section of the report describes the environmental baseline in relation to water resources and flood risk that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.5.20 The assessment scope, key assumptions and limitations for the water resources and flood risk assessment are as set out Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.
- 5.5.21 The installation of temporary turbidity treatment equipment at the three abstraction sites will be within temporary structures, and will not require significant below ground works. Therefore this amendment will not give rise to new or different significant effects on groundwater bodies during the construction period. As such these receptors have not been assessed, except with regard to flooding from groundwater.
- 5.5.22 This assessment considers the impact of construction and operation on existing PWS. However, the assessment does not consider the potential for impacts associated with the development of alternative groundwater sources, or changes to the abstraction regime at any of the existing PWS sites.

Existing baseline

- 5.5.23 A summary of the baseline information relevant to the assessment of the amendment is provided. For those receptors described in the main ES, further details are provided in the main ES Volume 2, CFA7, Section 13.3 and Volume 5, Appendix WR-02-007.
- 5.5.24 Table 9 details the surface water features potentially affected by the amendment.

Table 9: Surface water features potentially affected by the temporary provision of turbidity treatment equipment in the Colne Valley

Water feature	Location description (Volume 5, Water Resources and Flood Risk Assessment Map Book map reference)	Watercourse classification	WFD water body (water body number) and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value
Grand Union Canal	Runs adjacent to TH175, and within 500m of TH171 and TH173.	Artificial	Grand Union Canal, Maple Lodge to Uxbridge (Rivers Colne and Chess plus canal sections) WFD water body reference: GB70610252 Moderate	Good potential (by 2015)	Very High
River Colne	Branch runs adjacent to TH173 and within 500m of TH171 and TH175.	Main river	Colne and Grand Union Canal (from confluence with Chess to Ash) WFD water body reference: GB106039023090 Poor	Good Potential	Very High

Water feature	Location description (Volume 5, Water Resources and Flood Risk Assessment Map Book map reference)	Watercourse classification	WFD water body (water body number) and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value
Springwell Lake	Adjacent to TH175	Lake	Not applicable	Not applicable	Moderate
Lynsters Lake	To the north of TH171	Lake	Not applicable	Not applicable	Moderate
Pynesfield Lake	To the south of TH171	Lake	Not applicable	Not applicable	Moderate
6 unnamed lakes	Close to TH171	Lake	Not applicable	Not applicable	Moderate

5.5.25 PWS TH173 is located on the left bank of the River Colne, and is partially within Flood Zones 2 and 3. PWS TH175 is located on an area of higher land in Flood Zone 1 i.e. outside of the River Colne flood zones. PWS TH171 is located entirely within Flood Zone 2.

5.5.26 According to the agreed data sets, there is no significant risk of flooding at the pumping stations from surface water or sewers. These sources are therefore excluded from the assessment.

5.5.27 According to the LBH PFRA, there is an increased potential for elevated groundwater within the valley of the River Colne, confirmed in the Buckinghamshire and Hertfordshire PFRAs, which indicated that more than 75% of the area is susceptible to groundwater flooding. However, as described in the main ES (Volume 5: Appendix WR-003-007), small scale, above ground works are unlikely to affect the risk of flooding in the area from groundwater. These sources are therefore excluded from the assessment.

Future baseline

Construction (2017)

5.5.28 The future baseline for construction in 2017 remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 13.3).

Operation (2026)

5.5.29 The future baseline for operation in 2026 remains unchanged from that reported in the main ES (Volume 2, CFA7, Section 13.3).

Effects arising during construction

5.5.30 The turbidity treatment equipment included as part of the amendment will be installed in accordance with the measures contained in the draft CoCP. This will ensure that the AP4 revised scheme will not have an adverse effect on surface water quality. The effect is considered neutral and not significant and will not change the level of significance of the effects reported in the main ES.

- 5.5.31 The turbidity treatment equipment will be located within the curtilage of the existing pumping stations. In the context of the volume of flooding expected along the Colne Valley, in both a flood event arising from the river and in the event of reservoir failure, the loss of storage in the floodplain from equipment of this size would be negligible. As a result, no significant effects on the risk of flooding from these sources is expected. Equipment will be located outside of the areas at risk of flooding where practicable, both to further reduce any loss in floodplain storage and to protect the equipment from potential flood damage.
- 5.5.32 Until a management strategy is agreed with the Environment Agency in consultation with Affinity Water, there is the potential for residual significant effects associated with turbid groundwater reaching PWS abstractions. However, this effect will be removed if the amendment is implemented and turbid water is treated.

Effects arising from operation

- 5.5.33 The proposed turbidity treatment equipment will not give rise to a new or different significant effect and will not change the level of significance of the effects reported in SES₃ in Part 1 of this CFA report.

Mitigation and residual effects

- 5.5.34 The draft CoCP sets out the measures and standards of work that will be applied to the construction of the AP₄ revised scheme (see the main ES, Volume 5, Appendix CT-003-000). These will provide effective management and control of the impacts during the construction period.
- 5.5.35 No additional mitigation measures (i.e. in addition to those identified in the main ES and subsequent SES reports) are required.
- 5.5.36 There are no new or different residual significant effects for water resources or flood risk as a result of amendment, in comparison with the main ES. This amendment will form part of the management strategy to remove the residual significant effects associated with turbid groundwater reaching PWS abstractions, as reported in SES₃ in Part 1 of this CFA report.

Cumulative effects

- 5.5.37 There are no new or different likely significant cumulative effects for water resources and flood risk assessment as a result of the amendment acting in combination with another amendment in AP₄, or as a result of any relevant committed development interacting with the AP₄ revised scheme.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.5.38 The amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any environmental topic.

5.6 Provision of a cantering route between Bridleways CSP/44 and Rickmansworth 004 (AP4-007-004)

- 5.6.1 The Bill provides for the permanent provision of an overbridge up to approximately 1m above the existing ground level, providing a realignment of Tilehouse Lane and Bridleway Rickmansworth 004 over the route. The diversion of the bridleway via the Tilehouse Lane overbridge would result in a loss of a straight length of bridleway that is used by equestrians for cantering (see map CT-05-022 and CT-06-022 in main ES, Volume 2, CFA7 Map Book).
- 5.6.2 Since submission of the Bill, the opportunity has been identified to provide a new section of bridleway parallel to, and south of, the HS2 route between the realigned bridleways CSP/44 and Rickmansworth 004, through Old Shire Country Park. The bridleway will be approximately 700m long and will be straight to enable cantering (see maps CT-05-022 and CT-06-022 in the SES3 and AP4 ES, Volume 2, CFA7 Map Book). The works are expected to take approximately one month to complete. The cantering route will be constructed during construction of West Hyde embankment, which is planned to commence in early 2018 and will take approximately three years and six months to complete, as reported in the main ES (Volume 2, CFA7).
- 5.6.3 The provision of a new section of bridleway is not considered to make changes that require a reassessment of the environmental effects or proposed mitigation as set out in the main ES with respect to: air quality; community; cultural heritage; ecology; land quality; landscape and visual assessment; socio-economics; sound, noise and vibration; traffic and transport; and water resources and flood risk assessment. However, there were changes where reassessment was considered to be required in respect of agriculture, forestry and soils.

Agriculture, forestry and soils

Introduction

- 5.6.4 This section of the report describes the environmental baseline in relation to agriculture, forestry and soils that is relevant to the assessment. It then identifies any new or different likely significant environmental effects as a result of the amendment, compared to those of the SES3 scheme.

Scope, assumptions and limitations

- 5.6.5 The assessment scope, key assumptions and limitations for agriculture, forestry and soils are as set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2) of the main ES.
- 5.6.6 The area of agricultural land affected by the amendment is small (0.6ha) and will not alter the significance of effect, or result in any material different effect, in terms of the loss of best and most versatile (BMV) agricultural land or forestry land within the CFA. The route-wide effects on BMV land and forestry land are reported in Volume 3.

Existing baseline

- 5.6.7 Home Farm (CFA07/2) will be affected by the amendment. It is a large arable and beef unit extending to approximately 1,200ha.

Future baseline

Construction (2017)

- 5.6.8 Volume 5, Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments that are assumed to have been implemented by 2017, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.6.9 None of the identified developments affect the assessment of the AP4 revised scheme's likely construction impacts on agriculture, forestry and soils.
- 5.6.10 Most existing environmental stewardship agreements will expire in 2015 and will be replaced by a new environmental land management scheme (countryside stewardship) which, together with the new greening measures introduced by Common Agricultural Policy reform, will affect the detailed management of individual farm holdings. These are not expected to change fundamentally the baseline conditions.

Operation (2026)

- 5.6.11 Volume 5, Appendix CT-004-000 of the SES3 and AP4 ES provides details of the developments that are assumed to have been implemented by 2026, additional to those identified under the same reference number in the main ES and the SES and AP2 ES.
- 5.6.12 None of the identified developments affect the assessment of the AP4 revised scheme's likely operation impacts on agriculture, forestry and soils.

Effects arising during construction

- 5.6.13 The main ES reported that 94.2ha of agricultural land was required permanently from Home Farm for the construction of the original scheme. This is approximately 8% of the holding. This, along with severance, was assessed as a moderate adverse effect, which is significant. An additional area of approximately 0.6ha is required for the construction of the bridleway. There will also be an area of approximately 2.7ha severed from the remainder of the holding between the bridleway and the route of the scheme that will not be readily accessible for agricultural machinery and will be too narrow for effective arable cropping. The amendment will therefore remove a further 3.3ha from the holding, taking the total land area required permanently to 97.5ha (approximately 8% of the holding). The amendment will not give rise to a new or different significant effect on the holding and will not change the level of significance of the effects reported in the main ES.

Effects arising from operation

- 5.6.14 The bridleway through Old Shire Country Park will not give rise to a new or different significant effect during operation and will not change the level of significance of the effects reported in the main ES.

Mitigation and residual effects

- 5.6.15 No additional mitigation measures are proposed for this amendment. The amendment will result in no change in the likely residual significant effects reported in the main ES.

Cumulative effects

- 5.6.16 There are no new or different likely significant cumulative effects for agriculture, forestry and soils as a result of the amendment acting in combination with another amendment in AP4, or in AP1 or AP2, or as a result of any relevant committed development interacting with the AP4 revised scheme.

Summary of new or different likely residual significant effects as a result of the amendment

- 5.6.17 The amendment does not change the significant residual environmental effects or mitigation as set out in the main ES (Volume 2, CFA7) for any environmental topic.

6 Combined effects of amendments in this CFA due to changes in traffic flows

- 6.1.1 All of the effects of the changes proposed in this CFA have been described above and there are no further combined effects to report.

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