

HIGH SPEED RAIL (LONDON - WEST MIDLANDS)

Supplementary Environmental Statement 2 and Additional Provision 3 Environmental Statement

Volume 5 | Technical appendices

Summary of carbon calculation outputs

CL-002-000

September 2015

SES2 and AP3 ES 3.5.8



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Department for Transport

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SES2 and AP3 ES Appendix CL-002-000

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1 Introduction

- 1.1.1 This appendix provides an update to Appendix CL-002-000 from the main Environmental Statement (ES) (published in November 2013) as a result of design changes and amendments assessed as part of the Supplementary Environmental Statement 2 (SES2) and the Additional Provision 3 Environmental Statement (AP3 ES). This update should be read in conjunction with Appendix CL-002-000 from the main ES.

2 Description of the scoping assessment

- 2.1.1 A process was developed to identify which of the SES2 design changes and AP3 amendments could be material¹ from a greenhouse gas (GHG) emissions perspective and therefore require assessment. The assessment process comprised the following steps:

1. establish the percentage of construction elements², by type, in the main ES that are altered (i.e. a modification in design, a completely new addition or removal of a construction element) by the SES2 design changes or AP3 amendments. For example, there were 119 road-related elements in the main ES of which one is affected by the AP3 revised scheme, thus comprising 0.8% of the total of road-related elements;
2. estimate the potential for the SES2 design changes and AP3 amendments to influence the total construction or operational carbon footprint reported in the main ES based on the average contribution of the relevant construction elements. Where amendments are considered to exceed 1% of the construction carbon footprint; they have been identified as potentially material. For example, the road related AP3 amendment; based on the average construction carbon footprint of a road-related element, this amendment would increase the overall construction GHG emissions by less than 0.02% and has not been identified as material; and
3. review each SES2 design change and AP3 amendment to understand each change from a qualitative perspective. For example, relocation of construction elements that were set out as part of the original scheme may have associated impacts. For example, design change SES2-002-001 (the removal of the HS1-HS2 Link) will influence the GHG emissions associated not only with tunnels, portals and dive-unders, but also with movement of excavated materials and track.

- 2.1.2 Using the three-stage process listed in paragraph 2.1.1 it was determined whether an amendment or design change was either:

¹ 'Material' in this context refers to changes in the design and construction of the HS2 scheme that are considered to be large enough to materially alter (increase or decrease) the scheme's total construction GHG emissions.

² Construction elements refers to elements that make up the HS2 scheme such as bridges, viaducts, roads, tunnels, track, stations etc.

- non-material: represents a situation where the presumed GHG emissions impact of the design change or amendment is considered negligible and updating the carbon footprint for this element is not necessary (i.e. it is not necessary to update the carbon footprint of the main ES as a result of the amendment); or
- potentially material: represents a situation where, for a single construction element (i.e. a bridge) or a combination of similar construction elements (i.e. a group of bridges), the GHG emission impact of the SES design change or AP3 amendment is considered potentially material and that updating the carbon footprint of this construction element is necessary.

3 Scoping exercise results

- 3.1.1 Table 1 and Table 2 present the SES2 scoping exercise results, where SES2 design changes were compared to figures presented within Appendix CL-002-000 of the main ES. The scoping exercise results identified that the construction related GHG emissions due to the removal of the HS1-HS2 Link and changes at Euston Station could be potentially material and required further analysis.
- 3.1.2 Potential for material changes to the HS2 scheme’s operational GHG emissions as a result of the removal of the HS1-HS2 Link were considered as part of the scoping assessment. The removal of the link between Old Oak Common and St Pancras Station is predicted to result in trains being re-routed the short distance to Euston Station. The travel distance and therefore the associated GHG emissions from Old Oak Common and St Pancras Station versus Oak Common and Euston Station is not considered material in the context of the overall scheme. It is also unlikely that the removal of the HS1-HS2 Link would affect modal shift, as it not expected that a significant number of passengers would change their decision to use the high speed service, but use the existing London Underground services for connections rather than the HS1-HS2 Link. Similarly it is not expected that this change would affect the freight uptake of capacity realised on the classic network and the associated carbon benefits. On this basis it is not expected that there will be a material change in operational GHG emissions from this design change.
- 3.1.3 The potential increase in operational GHG emissions from the Euston Station design change was also assessed. Operational GHG emissions for the station are predicted to be 4% higher with the proposed change (over a 60 year period) which is equivalent to a 0.8% increase in the scheme’s total operational GHG emissions (over a 60 year period) and a 0.3% increase in the total overall carbon footprint considering both construction and operational GHG emissions. On this basis, operational GHG emissions associated with the Euston Station design change are not deemed material.
- 3.1.4 Table 3 and Table 4 present the AP3 scoping exercise results. The impact of the AP3 amendments on the overall carbon footprint presented in Volume 3 of the main ES would be non-material and therefore do not require any further analysis.

4 Carbon assessment methodology

- 4.1.1 The total GHG emissions change was calculated from the sum of the changes for each SES2 design change considered material. This calculation did not include contributions from the AP3 amendments since they were considered to be non-material at the route-wide level.

Table 1: SES2 results from the quantitative element of the scoping exercise

Construction element types	Main ES - number of construction elements	Main ES - carbon contribution (%) by construction element type	Number of SES2-related changes, by construction element	SES2- related changes as a proportion (%) of the main ES construction elements type	Estimated carbon emissions (tCO2e) per main ES construction element type	Estimated carbon emissions (tCO2e) of SES2-related changes	SES2-related changes in carbon emissions as a % of total construction emissions
Earthworks ³	-	10.4%	2	see footnote	see footnote	see footnote	see footnote
Demolition	108	0.5%	-	-	-	-	-
Construction waste	184	0.3%	-	-	-	-	-
Land use, land-use change and forestry (LULUCF)	-	1.8%	-	-	-	-	-
Bridges	180	3.0%	-	-	-	-	-
Viaducts	59	9.8%	-	-	-	-	-
Roads	119	2.1%	-	-	-	-	-
Retaining walls	17	2.0%	-	-	-	-	-
Cuttings	31	5.8%	-	-	-	-	-
Embankments	41	0.1%	-	-	-	-	-
Tunnels and dive-under	35	22.6%	1	3%	36,310	36,310	0.6%
Tunnel boring machine (TBM)	-	4.9%	-	-	-	-	-
Stations/ interchanges	2	11.4%	1	50%	320,417	320,417	5.7%
Depots	2	0.1%	-	-	-	-	-
People mover	1	0.1%	-	-	-	-	-

³ Movement of excavated materials assessment considers the whole route not individual amendments or small sections. On this basis, determining potential materiality is based on likely scale of relevant changes not numbers or %.

Construction element types	Main ES - number of construction elements	Main ES - carbon contribution (%) by construction element type	Number of SES2-related changes, by construction element	SES2- related changes as a proportion (%) of the main ES construction elements type	Estimated carbon emissions (tCO2e) per main ES construction element type	Estimated carbon emissions (tCO2e) of SES2-related changes	SES2-related changes in carbon emissions as a % of total construction emissions
Track	1	17.6%	1	100%	991,293	991,293	17.6%
Rolling stock (life span 35 years)	-	4.1%	-	-	-	-	-
Other	117	3.3%	-	-	-	-	-
Mitigation (tree planting)	-	0.0%	-	-	-	-	-

Table 2: The SES2 qualitative aspect of the scoping exercise, along with justification text as to whether the amendment(s) are material, and final scoping results.

Construction element types	Justification text	Scoping result
Earthworks	The deletion of the HS1-HS2 Link will have a knock-on effect on excavated volumes as it involves removing 5km of tunnelled route. The second change which is likely to impact excavated materials is the re-design of Euston Station. Given the scale of the staged construction works at Euston Station, and that stations accounted for 11% of total construction emissions, it was assumed that this could have a material impact on excavated material.	Potentially material.
Demolition	-	-
Construction waste	-	-
LULUCF	-	-
Bridges	-	-
Viaducts	-	-
Roads	-	-
Retaining walls	-	-
Cuttings	-	-
Embankments	-	-
Tunnels and dive-under	The one SES2 design change is the removal of the HS1-HS2 Link from the proposed design. This involves the removal of 2.7km of tunnelled route in community forum area 3 (CFA3) and 2.3km in CFA2, as well as modifications to bridges and a viaduct. The total tunnel length for the proposed AP2 scheme is 52,333m. The removal of the HS1-HS2 Link represents a 10% reduction in total tunnel/portal length. Assuming a direct correlation between tunnel length and construction GHG emissions, this amendment would result in over 120,000 tCO2e construction GHG emissions being avoided, or a 2% decrease in the proposed scheme's total construction GHG emissions. The removal of the HS1-HS2 Link will also influence the volume of excavated material transported, as well as reduce track construction. It is assumed that the removal of this element is potentially material.	Potentially Material
TBM	-	-
Stations/ interchanges	The Euston Station and Approach area are being re-designed. The revised design involves the staged construction of the new high speed station. Given that the ES station construction footprint represented 11% of all construction GHG emissions, the changes proposed for Euston Station are considered potentially material for construction GHG emissions.	Potentially material.
Depots	-	-

Construction element types	Justification text	Scoping result
People mover	-	
Track	See 'tunnel' comment above.	Potentially Material
Rolling stock (life span 35 years)	-	-
Other	-	-
Mitigation (tree planting)	-	-

Table 3: AP3 results from the quantitative element of the scoping exercise.

Construction element types	Original ES elements	ES Carbon emissions % of total	Number of AP3-related changes, by construction element	AP3-related changes as a proportion (%) of the main ES construction elements type	Estimated carbon emissions (tCO2e) per main ES construction element type	Estimated carbon emissions (tCO2e) of AP3-related changes	AP3-related changes in carbon emissions as a % of total construction emissions
Earthworks	-	10.4%	-	-	-	-	-
Demolition	108	0.5%	-	-	-	-	-
Construction waste	184	0.3%	-	-	-	-	-
LULUCF	-	1.8%	2	-	-	-	-
Bridges	180	3.0%	-	-	-	-	-
Viaducts	59	9.8%	-	-	-	-	-
Roads	119	2.1%	1	1%	1,011	1,011	0.0%
Retaining walls	17	2.0%	-	-	-	-	-
Cuttings	31	5.8%	-	-	-	-	-
Embankments	41	0.1%	-	-	-	-	-
Tunnels & dive-under	35	22.6%	-	-	-	-	-
TBM	-	4.9%	-	-	-	-	-
Stations/ interchanges	2	11.4%	-	-	-	-	-
Depots	2	0.1%	-	-	-	-	-
People mover	1	0.1%	-	-	-	-	-
Track	1	17.6%	-	-	-	-	-
Rolling stock (life span 35 yrs)	-	4.1%	-	-	-	-	-
Other	117	3.3%	3	3%	1,583	4,750	0.1%

Construction element types	Original ES elements	ES Carbon emissions % of total	Number of AP3-related changes, by construction element	AP3- related changes as a proportion (%) of the main ES construction elements type	Estimated carbon emissions (tCO2e) per main ES construction element type	Estimated carbon emissions (tCO2e) of AP3-related changes	AP3-related changes in carbon emissions as a % of total construction emissions
Mitigation (tree planting)	-	0.0%	-	-	-	-	-

Table 4: The AP3 qualitative aspect of the scoping exercise, along with justification text as to whether the amendment(s) are material, and final scoping results

Construction element types	Justification text	Scoping result
Earthworks	-	-
Demolition	-	-
Construction waste	-	-
LULUCF	There are two land-use related amendments both of which are losses of land for parking spaces. In total the LULUCF area in the ES was 2,629ha. The anticipated area required for these amendments is a negligible percentage of this. This was considered to be a non-material impact.	Non-material impact.
Bridges	-	-
Viaducts	-	-
Roads	There is one road related amendment involving some additional road limits at Juniper Crescent. Given the ES comprised 119 road related elements, and the minor nature of the proposed AP3 amendment, this was considered as a non-material impact.	Non-material impact.
Retaining walls	-	-
Cuttings	-	-
Embankments	-	-
Tunnels and dive-under	The one amendment involves the re location of the Salusbury Road Vent Shaft to Canterbury Works. Given that this is not a new construction but a relocation, and aside from requiring some additional land, this was considered as a non-material impact.	Non-material impact.
TBM	-	-
Stations/ interchanges	-	-
Depots	-	-
People mover	-	-
Track	-	-
Rolling stock (life span 35 years)	-	-

Construction element types	Justification text	Scoping result
Other	<p>There are three 'other' amendments of which two are the provision of additional car parking spaces, and one is a concrete access ramp. No details are given regarding the scale of the new structures; however given that in the main ES there were 117 'other' related elements and total 'other' GHG emissions comprise 3% of the total AP3 ES carbon footprint these amendments, individually and in combination are classed as a non-material impact.</p>	Non-material impact.
Mitigation (tree planting)	-	-

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