EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Whole Life Carbon Assessment Report

Document Reference: 19309-XX-EC-XXX-000062

October 2024

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1 Introduction

1.1 Purpose of Document

1.1.1 The Proposed Development relates to provision of new airfield infrastructure that will enable alternation of departures and arrivals in an easterly direction between the two current runways. Further details are provided in **Section 2**.

1.1.2 This report provides an assessment of the total embodied carbon associated with the Proposed Development during the construction process. It presents the results of the assessment and also the measures which will be implemented during construction to reduce the total embodied carbon of the Proposed Development.

1.2 Planning Policy and Guidance

1.2.1 This Whole Life Carbon Assessment (WLCA) has been prepared in response to the planning requirements and guidelines outlined in the following documents:

- The London Plan 2021 – The Spatial Development Strategy for Greater London (2021) (Greater London Authority (GLA));[1]
- London Plan Guidance – Whole Life-Cycle Carbon Assessments (March 2022) (Greater London Authority);[2]
- British Standard (BS) EN 15978:2011 – Sustainability of construction works. Assessment of environmental performance of buildings[3];
- RICS Whole life carbon assessment (WLCA) for the built environment, 2nd edition (September 2023)[4];

[1] Greater London Authority (2021) *The London Plan* 2021. [Online] Available at https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf [Accessed: 17 October 2024].

[2] Greater London Authority (2022) *London Plan Guidance – Whole Life-Cycle Carbon* Assessments. [Online] Available at https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance [Accessed: 17 October 2024].

[3] British Standards Institute (2021) *BS EN 15978-1 Sustainability of construction works – Methodology for the assessment of performance of buildings. – Part 1: Environmental Performance*. [Online] Available at https://standardsdevelopment.bsigroup.com/projects/2020-01551#/section [Accessed: 17 October 2024].

[4] Royal Institution of Chartered Surveyors (RICS) (2024) *Whole life carbon assessment for the built environment*. [Online] Available at https://www.rics.org/content/dam/ricsglobal/documents/standards/Whole_life_carbon_assessment_PS_Sept23.pdf [Accessed: 17 October 2024].

- Hillingdon Local Plan: Part 1 – Strategic Policies (2012)[5]; and
- Hillingdon Local Plan: Part 2 – Development Management Policies[6].

Policy

The London Plan 2021 – The Spatial Development Strategy for Greater London (2021)

1.2.2 Targets for sustainable design are set out in The London Plan Chapter 9: Sustainable Infrastructure. The London Plan includes the following strategic policies which are relevant for the development:

1.2.3 Policy SI2 Minimising greenhouse gas emissions: This policy relates to the reduction of greenhouse gas emissions within major developments across London. Section 9.2.11 states that:

"*Whole life-cycle carbon emission assessments are therefore required for development proposals referable to the Mayor. Major non-referable development should calculate unregulated emissions and are encouraged to undertake whole life-cycle carbon assessments.*"

1.2.4 The Proposed Development is a major non-referable development and the associated WLCA is provided as best practice.

1.2.5 Policy SI7 Reducing waste and supporting the circular economy: This policy relates to resource conservation, waste reduction, increases in material re-use and recycling and reduction in waste going for disposal.

London Plan Guidance – Whole Life-Cycle Carbon Assessments (March 2022)

1.2.6 This guidance explains how to prepare a Whole Life-Cycle Carbon (WLC) assessment in line with Policy SI 2 of the London Plan 2021 using the WLC assessment template.

1.2.7 This guidance provides instructions on calculating WLC emissions and outlines the required information for policy compliance. Additionally, it offers insights into design principles and WLC benchmarks, assisting planning applicants in creating buildings with minimal operational and embodied carbon.

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[5] London Borough of Hillingdon (2012) *Hillingdon Local Plan: Part 1 – Strategic Policies*. [online] Available at: https://www.hillingdon.gov.uk/media/3080/Local-Plan-Part-1---Strategic-Policies/pdf/npLocal_Plan_Part_1_Strategic_Policies_15_feb_2013_a_1_1.pdf?m=1598370401647 [Accessed: 17 October 2024].

[6] London Borough of Hillingdon (2020) *Hillingdon Local Plan: Part 2 – Development Management Policies.* [online] Available at: https://www.hillingdon.gov.uk/media/3084/Hillingdon-Local-Plan-Part-2-Development-Management-Policies/pdf/pdLPP2_Development_Management_Policies_-_ADOPTED_VERSION_JAN_2020_1.pdf?m=1598370641570 [Accessed: 17 October 2024].

Hillingdon Local Plan: Part 1 – Strategic Policies (2012) and Part 2 – Development Management Policies (2020)

1.2.8 The Hillingdon Local Plan, set out in two parts, forms the council's future development strategy for the borough. It sets out a framework and detailed policies to guide planning decisions and it's the starting point for considering whether planning applications should be approved. Relevant policies for the current Proposed Development are:

1.2.9 Policy EM1:

"*The Council will ensure that climate change mitigation is addressed at every stage of the development process by:… Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market*"[5].

This constitutes the requirement for the consideration of GHG emissions from the Proposed Development to be evidenced.

1.2.10 Policy DMEI 2:

In relation to development applications: "*A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.*"[6]

This therefore requires evidence of evaluation of GHG emissions impacts associated with proposed design work.

1.2.11 Policy DMEI 14:

In relation to development applications:

- "*A) Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants.*
- *B) Development proposals should, as a minimum:*
  - *i) be at least "air quality neutral";*
  - *ii) include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and*
    - *iii) actively contribute towards the improvement of air quality, especially within the Air Quality Management Area.*" [6]

1.2.12 The Proposed Development needs to evidence how it has accounted for maintaining air quality standards.

1.2.13 Policy DMAV 2 states*:*

"*Heathrow Airport*

A) Development proposals within the Heathrow Airport boundary will only be supported where:

- *iv) "there are no other significant adverse environmental impacts; where relevant, an environmental impact and/or transport assessment will be required with appropriate identification of mitigation measures; and*
- *v) they comply with all other relevant policies of the Local Plan*".[6]

1.2.14 The Proposed Development is required to demonstrate appropriate assessment of environmental impacts in its design.

1.3 Guidance

RICS – Whole Life Carbon Assessment for the built environment

1.3.1 The RICS Whole Life Carbon Assessment document is a technical methodology for assessing the carbon impacts from buildings and related infrastructure assets/civil engineering works throughout their life cycle requirements. The document draws from a selection of standards on sustainable construction and greenhouse gas reduction to provide requirements and supporting guidance for conducting a whole a life carbon assessment.

British Standard – BS EN 15978:2011

1.3.2 The British Standard provides guidance on sustainability of construction works and the assessment of environmental performance of buildings. This standard provides a method for calculating environmental performance and suggests ways in which to communicate and display the outcome.

PAS 2080:2023 Carbon management in buildings and infrastructure

1.3.3 PAS 2080 specifies requirements for the management of whole life carbon in buildings and infrastructure in the provision, operation, use and end of life of new projects or programmes of work as well as the management or retrofit of existing assets and networks.

2 The Proposed Development

2.1 The current state of the environment

Runways

2.1.1 Heathrow has two runways: the northern runway (09L/27R) being 3,902m long and the southern runway (09R/27L) being 3,660m long. Both are oriented east to west.

Terminals

2.1.2 Heathrow operates four terminals, referred to as Terminal 2 (T2), Terminal 3 (T3), Terminal 4 (T4) and Terminal 5 (T5), where passengers arrive at and depart from the Airport. Terminal 1 is no longer in use for passenger and aircraft operations. T2 and T3 form a cluster of terminal buildings known as the Central Terminal Area (CTA), which is situated in the central part of the Airport between the northern and southern runways.

2.1.3 T4 is located on the south-eastern section of the airfield to the east of the cargo terminal and south of Runway 09R/27L (the southern runway). It is connected to the CTA via the Heathrow Cargo Tunnel.

2.1.4 T5 is situated between the northern (09L/27R) and southern (09R/27L) runways at the western end of the airfield. It comprises a main four-storey terminal building and two satellite buildings, which are linked to the main terminal building by an underground people mover transit system.

2.1.5 Cargo facilities are located on the southern part of the airfield with aircraft maintenance facilities situated at the far eastern end of the airfield between the two runways. The Air Traffic Control (ATC) tower is located in the central part of the airfield between the CTA and T5. The height of the ATC tower structure is 87m, which provides unobstructed 360 views of the entire airfield for controllers.

2.2 Taxiways

2.2.1 Heathrow has a taxiway network to circulate aircraft between the terminals and the runways under the guidance of air traffic control. The taxiway network comprises four parallel taxiways (two serving each of the runways), which are linked by cross field taxiways. There are also taxiways south of the southern runway, including one parallel taxiway, connecting T4 and the cargo area to the rest of the Airport. Runway links, including exit taxiways and Runway Access Taxiways (RATs), connect the parallel taxiways to the runways and are used by aircraft entering and exiting the runways. More minor taxiway links and cul-de-sac taxi lanes connect all the taxiways to the aircraft stands.

2.3 Aprons

2.3.1 Aprons are a designated space on an airfield for the parking of aircraft, refuelling, and the loading and unloading of passengers and freight. Each terminal building at Heathrow has

its own aprons. Additionally, there is a cargo apron in the south of the Airport for designated freight aircraft and maintenance aprons in the east of the Airport.

2.3.2 The aprons provide parking space for a wide range of passenger and cargo aircraft, from the smaller turboprop ATR72 or Boeing 737 up to large aircraft such as the Airbus A380 or Boeing 747.

2.4 Ancillary facilities

2.4.1 Ancillary facilities support the operation and maintenance of the Airport**.** They include maintenance and repair facilities, warehousing and cargo storage facilities and other Airport operational land (such as surface water pollution control, balancing ponds, construction compounds for ongoing work, in–flight catering facilities, air traffic control, baggage and parking for service equipment). These are located throughout the Airport.

2.5 Grassland

2.5.1 Aside from areas of hardstanding and other built features such as terminal buildings and carparks, the Airport is mainly comprised of airfield grassland which occurs between runways and taxiways. A minimum uniform sward height of 15 to 25cm ensures the grassland remains of poor quality with low species diversity in line with the Airport's bird strike management policy as prescribed by the Civil Aviation Authority under their Publication CAP 772. Further details are provided in **Chapter 12: Biodiversity**.

2.6 Background to Proposed Development

2.6.1 The Proposed Development does not involve any increase in aircraft movements, which are capped at Heathrow. Its purpose is to enable departures and arrivals in an easterly direction to alternate between the northern and southern runways, as they currently do on westerly operations. Runway alternation in an easterly direction has not occurred at the Airport routinely because it was prevented by a historic agreement known as the Cranford Agreement, which ended in January 2009.

2.6.2 The Applicant is aiming to introduce easterly runway alternation by 2028 as set out in Heathrow's Sustainability Strategy, Heathrow 2.0[7]. Easterly alternation would bring predictable periods of respite from aircraft noise to thousands of residents. The introduction of easterly alternation would mean that affected communities would share environmental effects and the benefit of respite fairly and equally, as they do today when the Airport is on westerly operations.

[7] Heathrow Airport Limited (2022) *Heathrow 2.0: Connecting people and planet.* [online] Available at: https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/heathrow-2-0-sustainability/futher-reading/Heathrow%202.0%20Connecting%20People%20and%20Planet%20FINAL.pdf [Accessed: 17 October 2024].

2.7 Proposed infrastructure

2.7.1 The extent of the new airfield infrastructure works is relatively limited and can be broken down into two clear works extents.

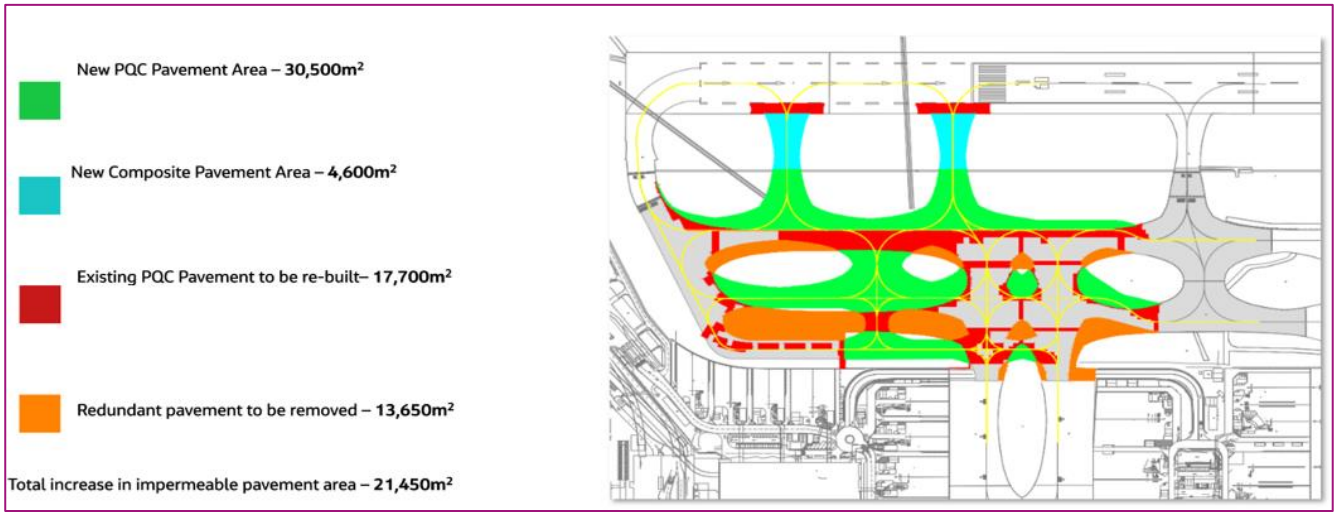
2.8 New Airfield infrastructure

2.8.1 The Applicant is seeking planning permission for the construction of the following components:

- Taxiways and links to comprise a Runway Hold Area at the western end of Runway 09L. This includes:
  - Two new Runway Access Taxiways (RATs) onto Runway 09L;
  - Link 57 realigned and re-provided as a Code F Taxiway with a tie into the existing Taxiway Alpha North, east of Link 58;
  - Link 56 realigned and provided as a Code E Taxiway with a tie into the existing Taxiway Bravo North, east of Link 58;
  - A new Code C Taxilane to serve the stands north of T5a extending to the existing Taxiway Bravo;
  - A new north-south link connecting the realigned Link 56, Link 57 and Code C Taxilane;
  - Construction of underground services to serve the new infrastructure;
- Removal of redundant areas of airfield pavement and reinstatement to grass areas to accommodate the construction of the new taxiway infrastructure listed above;
- Re-grading of airfield grass areas to accommodate the construction of the new taxiway infrastructure listed above; and
- Breaking out of existing areas of redundant pavement (on the existing airfield).

2.8.2 **Graphic 2.1** shows the extent of the proposed works and the total surface area of new pavement.

Graphic 2.1: Map of existing, new and proposed to be removed ground infrastructure.



2.9 Noise barrier

2.9.1 A noise barrier will be constructed to the south of Longford village to offer additional mitigation against noise impacts resulting from the Proposed Development. The western section will be 343m in length and will predominantly follow the alignment of the existing timber noise barrier that is situated between the Wright Way and the Duke of Northumberland River. The eastern section will be 438 m in length and would follow the alignment of the existing timber perimeter fence surrounding the T5 Business Car Park. This section will also include an access gate to facilitate maintenance to the Duke of Northumberland River.

2.9.2 The current expectation is that the noise barrier would vary in height along its length. The height along the majority of the barrier (approximately 550m) will be approximately 7m, but some sections are proposed at approximately 5m. The noise barrier will be constructed with the lowest 3m constructed from timber and the upper 2 to 4m being transparent (for the 5m and 7m sections respectively). The transparent material will allow views to the airfield from Longford to be maintained. The transparent section of the noise barrier will also have measures included on it to reduce the likelihood of bird strike.

3 Methodology

3.1 Purpose

3.1.1 The purpose of a WLCA is to assess the embodied environmental impacts associated with a project during its construction. A key environmental impact is embodied carbon. Expressed in CO_2e, or carbon dioxide equivalent emissions, this represents the total global warming potential associated with the extraction, manufacture, transportation, construction, replacement and end of life of a project's materials. Reporting as a single metric ensures that the different impacts of the range of greenhouse gases (GHGs) are adequately captured.

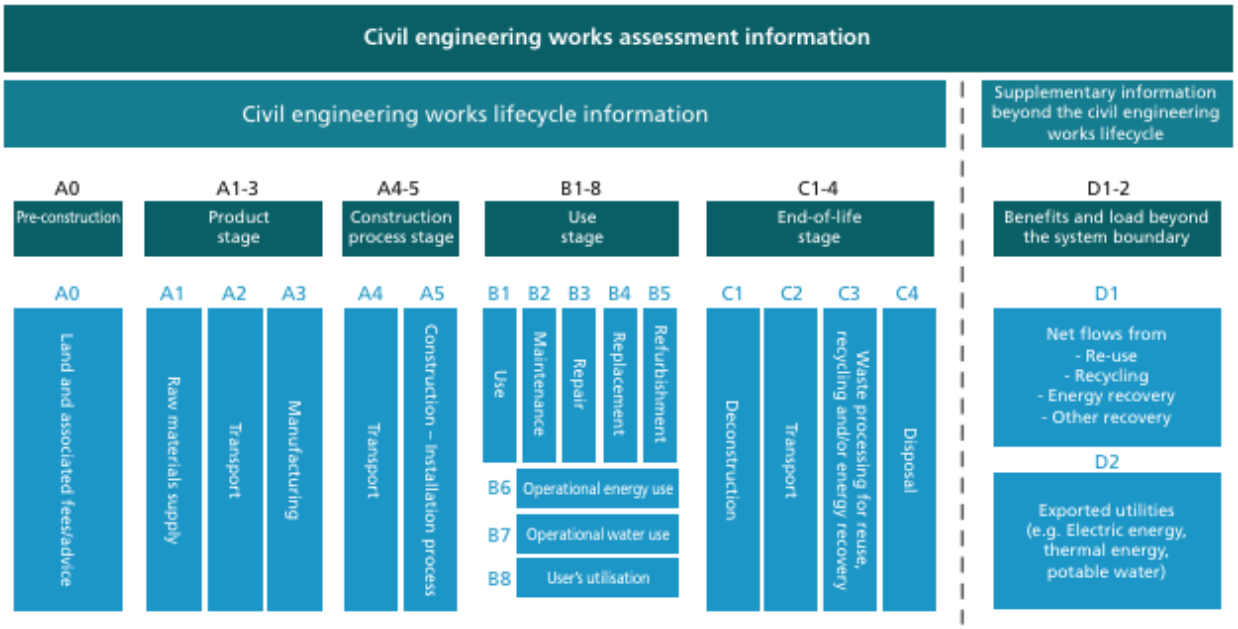
3.1.2 Sources of these emissions are presented in **Graphic 3.1**. The stages which have been considered in the assessment, and how associated CO_2e emissions are quantified are outlined in this section.

3.2 Quantification of GHG emissions

3.2.1 The approach to quantifying the GHG emissions associated with the Proposed Development aligns with the infrastructure life cycle phases as described within the PAS 2080: Carbon Management in Infrastructure[8] standard. These are summarised in **Graphic 3.1**. The focus is on the 'before use stage' (A0-A5).

[8] British Standards Institution (2016) *PAS 2080: 2016 – Carbon management in infrastructure*. [online] Available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030323493&creative=443668107352&keyword=&matchtype=b&network=g&device=c&gclid=EAIaIQobChMI1pLT1OCG7QIVB813Ch3RrwQUEAAYAiAAEgJXGfD_BwE [Accessed: 17 October 2024].

*Graphic **3**.1: Infrastructure life cycle stages*



3.2.2 GHG emissions associated with the emissions sources have been generally calculated using the following equation:

Activity data x GHG emissions factor = GHG emissions value

3.2.3 Design information has been used in calculations where this detail was available (see **Construction Environmental Management Plan**). Where relevant, assumptions were made to characterise the likely activities associated with the Proposed Development and therefore enable GHG emissions to be determined (see Study Limitations in **Section 3.5**). These assumptions ensure a proportionate assessment has been carried out. Detailed in **paragraphs 3.3.1** to **3.3.6** below is the overarching methodology for each defined PAS 2080 infrastructure lifecycle stage which was used to characterise the GHG emission sources during the Proposed Development.

3.3 Construction Phase

3.3.1 The focus of the assessment was on construction emissions, the cumulative emissions of processes up to handover of the construction phase to the 'use stage' (A0 – A5).

3.3.2 They are divided into the following categories:

A1-A2-A3 – Product stage: raw material supply, transport and manufacture

3.3.3 Embodied carbon represents the sum of GHG emissions covering extraction of raw and primary materials and their manufacture and refinement into products and construction materials, as well as the transport and supply logistics to the factory gate. The Inventory of

Carbon and Energy (ICE) Database[9] was used as a primary source of relevant emission factors.

3.3.4 A list of material resources required for both the construction of pavement area and the noise barrier has been based upon available design information (see **Construction Environmental Management Plan**).

A4 – Construction transport

3.3.5 Surface access emissions associated with construction activities were estimated based on trip length and using the Department for Environment, Food and Rural Affairs (Defra) Emissions Factors Toolkit (EFT) (version 12)[10]. Details on the number of vehicles were estimated through available design team information (see **Construction Environmental Management Plan**) and distances travelled by construction vehicles were estimated using Department for Transport (DfT) datasets.[11] DfT data on commuting distances[12] were used to determine the GHG emissions from construction workers travelling to the Proposed Development.

A5 – Construction process stage

3.3.6 Construction process emissions (including on-site energy and water use, and waste generated) in the construction phase were calculated. In the absence of run times for the machinery that would be used to construct the proposed pavement area and noise barrier, construction process emissions were estimated as a proportion of embodied carbon for different stages in the lifecycle. The estimated proportion of lifecycle emissions were taken from a recent Engineering and Physical Sciences Research Council study and using professional judgement from similar construction programmes.[13]

3.4 Published Datasets

3.4.1 A number of publicly available datasets have been used in the current assessment as summarised in **Table 3.1.**

[9] Circular Ecology (2019) *Embodied Carbon – The ICE Database*. [online] Available at: https://circularecology.com/embodied-carbon-footprint-database.html#.XKX_oJhKhPY [Accessed: 17 October 2024].

[10] Department for Environment, Food and Rural Affairs (2021) *Emissions Factors Toolkit v12*. [online] Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/ [Accessed: 17 October 2024].

[11] Department for Transport (2023) *Table RFS0108: Domestic road freight statistics: July 2021 to June 2022*. [online] Available at: https://www.gov.uk/government/statistics/domestic-road-freight-statistics-july-2021-to-june-2022 [Accessed: 17 October 2024].

[12] Department for Transport (2023) *NTS0403e: National Travel Survey: 2022*. [online] Available at: https://www.gov.uk/government/statistics/national-travel-survey-2022 [Accessed: 17 October 2024].

[13] Lokesh, K., Densley-Tingley, D. and Marsden, G. (2022) *Measuring Road Infrastructure Carbon: A 'critical' in transport's journey to net-zero*. [online] Available at: https://decarbon8.org.uk/wp-content/uploads/sites/59/2022/02/Measuring-Road-Infrastructure-Carbon.pdf [Accessed: 17 October 2024].

Table 3.1: Data sources used to inform the WLC assessment

Organisation	Data source	Data provided
Circular Ecology	Embodied Carbon – The ICE Database[9]	Embodied carbon figures from the ICE database are considered as the emission factor for calculating embodied carbon in the GHG assessment
Department of Transport	Table RFS0108: Domestic road freight statistics: July 2021 to June 2022[11]	The distances travelled by construction vehicles were estimated using Department for Transport datasets
Department of Transport	DfT (2023). NTS0403e: National Travel Survey: 2022[12]	Data on commuting distances was used to determine the GHG emissions from construction workers travelling to the Works Area

3.5 Study Limitations

3.5.1 A number of working assumptions have been made in order to ensure that a proportionate assessment has been undertaken. Specifically:

- For the calculation of transport emissions, the one-way transport distance for construction materials (via heavy goods vehicles) is estimated to be 108km. Commuting distances for light goods vehicles is estimated to be 14km. This is based on the Department for Transport11 12 datasets on the average length of haul by type and weight of vehicle and average commuting distances.

- In the calculation of construction process emissions, emissions were estimated as a percentage of embodied carbon emission. Construction process emissions were estimated as 2% of lifecycle emissions, whereas embodied carbon of raw materials was estimated as 70%. These proportions were taken from a recent Engineering and Physical Sciences Research Council study.13

3.6 Project Whole Life Carbon (WLC) Principles

3.6.1 There are a number of guidance principles set by the GLA for WLCAs. This section presents environmental measures, relevant to these guidance principles, that have been embedded into the Proposed Development. The measures are designed to minimise the GHG emissions associated with the Proposed Development.

Material selection and Circular economy principles

3.6.2 When materials are being chosen for the Proposed Development efforts will be made to select low carbon options wherever possible and if feasible circular economy principles will be used (see separate **Circular Economy Statement**). This includes re-use of excavated soil and concrete in the provision of taxiways and aprons. Sourcing of recycled material for the noise barrier, such as timber, should also be considered. The suitability of recycled materials will be determined by the Contractor in ensuring adequate functionality and durability to minimise ongoing maintenance.

Local sourcing

3.6.3 Where possible, local sourcing of construction materials will be promoted. Preference will be given to locally selecting and sourcing materials, as long as this can be accomplished without compromising environmental impact.

3.6.4 It is estimated that the Proposed Development would give rise to surplus materials: Granular Type 1 sub-base, excavated subsoils and excavated topsoil. These would be retained as far as is possible at a suitable location for Heathrow Airport and made available for re-use on future projects (see **Construction Environmental Management Plan**). If this is not practicable to consider, it would be made available for the benefit of other local projects within the London Borough of Hillingdon or adjacent boroughs. Materials that do not have a destination use would first be registered on the London Waste Map[14].

Efficient construction

3.6.5 Energy efficient and well-maintained plant equipment will be used. A list of make and model of all equipment to be used is detailed in the Easterly Alternation Infrastructure **Construction Environmental Management Plan**. Power needs would be met using mains electricity, in preference to diesel-fuelled portable generators (in all activities where this is possible).

3.6.6 In construction, deliveries will be consolidated where possible and there would be ‘no idling’ vehicles. Sustainable modes of travel for the construction workforce will be encouraged where possible.

[14] Mayor of London (n.d.) *Waste Map*. [online] Available at: https://apps.london.gov.uk/waste/ [Accessed: 17 October 2024].

4 Results

4.1 Overview

4.1.1 The WLCA summarises the total embodied carbon emissions in construction of the Proposed Development throughout its lifetime. This assessment follows the methodology outlined in the above section to ensure robustness and consistency in the results. Due to the nature of the Proposed Development the majority of expected carbon emissions result from the embodied emissions in construction materials and related to transport to Site.

4.2 Embodied

4.2.1 Outlined in **Table 4.1** are the key construction materials that will be used (as referenced in **Construction Environmental Management Plan**) in the Proposed Development and that contribute to the total embodied carbon emissions.

Table 4.1: Selected materials and associated GHG intensity factors tCO2e/t9

Material	tCO_2e/kg
Concrete (General)	0.103
Pavement quality concrete	0.138
Wet lean concrete	0.065
Asphalt	0.553
Steel (hot dipped galvanised)	2.760
Timber (soft wood)	0.263
Glass Reinforced Plastic	8.100

4.2.2 Initial quantification of GHG emissions has been carried out as per **Section 3.2.1**. A summary of analysis for the Construction Phase (A1-5) GHG emissions is provided in **Table 4.2**.

Table 4.2: Emissions corresponding to construction.

Building Element	Building material	Total material emissions (tCO_2e)	Construction emissions (tCO_2e)	Transport emissions (tCO_2e)	Total (tCO_2e)
Noise Barrier	Concrete (general)	118	26	24	944
	Steel (hot dipped galvanized)	167			
	Timber (softwood)	50			
	Glass reinforced plastic	561			
Ground Works	Pavement quality concrete	6,823	307	1,359	12,409
	Wet lean concrete	865			
	Roller Compacted Concrete	1,214			
	Asphalt	1,841			
Total		**11,637**	**332**	**1,383**	**13,353**

Impact of demolition

4.2.3 Given that the Proposed Development is comprised of infrastructure changes within an existing airport, it is considered that the infrastructure would be maintained in the long-term. Consequently, emissions associated with decommissioning are not accounted for in this assessment.

5 Conclusions

5.1.1 Total GHG emissions in the construction phase are estimated at 13,353tCO_2e. Of these the majority are associated with ground works (12,409tCO_2e – 93%) with the remaining 7% (944 tCO_2e) relating to the noise barrier.

5.1.2 Primary materials account for 87% of the total ground works emissions. Over half (51%) of emissions associated with the Proposed Development are associated with the embodied carbon of Pavement Quality Concrete.

5.1.3 Mitigation actions to minimise whole life GHG emissions are set out separately in the **Construction Environmental Management Plan** and associated Site Waste Management Plan (SWMP).