Uxbridge Road, Hayes

Whole Lifecycle Carbon Assessment

Ensphere Group Ltd on behalf of
Shurgard UK Ltd

Ensphere Group Ltd
52 Grosvenor Gardens
London, SW1W 0AU
+44 (0) 20 7846 9040
www.enspheregroup.com

ensphere

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Contents

1. Executive Summary

1.1 This Whole Lifecycle Carbon ("WLC") considers the carbon emissions resulting from the construction and use of the proposed development at Uxbridge Road, Hayes, UB4 0HD.

1.2 Proposals include the partial demolition and extension to an existing building to provide additional self-storage floorspace (Use Class B8) with associated new car and cycle parking, refuse storage, landscaping and other associated works ancillary to the development.

1.3 Consideration has primarily been given to the planning policy and other relevant standards and guidance prior to specifying the assessment object.

1.4 All stages of the project have then been considered, from raw material extraction, product manufacturing, transport, and installation on site through to the operation, maintenance, and eventual material disposal.

1.5 Best available data has been used, with the acknowledgement that this assessment has been undertaken at a relatively early stage of design.

1.6 Specialist software has been used with emissions calculated using the One Click LCA software, utilising both the IMPACT compliant & BRE approved LCA calculation tools, with geometry being created and defined within IES VE 2022 and exported to the One Click tool.

1.7 The assessment has reviewed WLC over a 60-year period, in line with the recommended RICS approach. This identified total WLC emission of 1,900,781 kgCO_{2e}. Embodied carbon was estimated at 348 kg/m^2 GIA.

1.8 The key lifecycle stages responsible for these emissions are [A1-A3] Materials Emissions (1,089,697 kg CO2e), the [B4] Material replacement (289,150 kg CO2e) and the [B6] Operational Energy Use (82,604 kg CO2e).

2. Introduction

2.1 Ensphere Group Ltd was commissioned by Shurgard UK Ltd to undertake a Whole Lifecycle Carbon Assessment for a proposed development at Uxbridge Road, Hayes, UB4 0HD.

Site and Surroundings

2.2 The application site (the 'Site') is located along Uxbridge Road/The Broadway, adjacent to the Grand Union Canal, and falling under the jurisdiction of London Borough of Hillingdon.

2.3 As existing, Site comprises an existing Shurgard self-storage facility with internal storage units within a 5-storey building and external direct-access storage units within a series of 1-storey structures. The ancillary shop is located at the front of the Site with a "lighthouse" attached.

2.4 Pedestrian and vehicular access is via Uxbridge Road/The Broadway. 15no. car parking spaces are provided beyond the secure gate.

2.5 Bounded by Uxbridge Road/The Broadway to the south, the Grand Union Canal to the east, residential dwellings to the west and Tollgate Drive to the north, the Site lies within an area of mixed townscape character. The immediate area is predominantly residential in character, with a mix of commercial and institutional uses on the opposite side of Uxbridge Road/The Broadway and the Grand Union Canal.

Proposed Development

2.6 Partial demolition and extension to existing building to provide additional self-storage floorspace (Use Class B8) with associated new car and cycle parking, refuse storage, landscaping and other associated works ancillary to the development.

Report Objectives

2.7 To assess the carbon emissions resulting from the construction and use of the building over its entire life, to improve understanding, consistent measurement and enable comparability of results, benchmarking and target setting to achieve carbon reductions.

3. Assessment Framework

3.1 Whole life-cycle carbon ("WLC") emissions are the carbon emissions resulting from materials, construction and use of a building over its entire life, including its demolition and disposal. A whole life carbon approach identifies the overall best combined opportunities for reducing lifetime emissions and helps to avoid unintended consequences of focusing on operational emissions alone.

Relevant Standards & Guidance

3.2 The framework for appraising the environmental impacts of the built environment is provided by BS EN 15978:2011, a European Standard now adopted at a national level. The Standard specifies the calculation method, based on Life Cycle Assessment (LCA) and other quantified environmental information, to assess the environmental performance of a building. It also gives the means for the reporting and communication of the outcome of the assessment.

3.3 The standard gives:

- The description of the object of the assessment;
- The system boundary that applies at the building level;
- The procedure to be used at the inventory analysis;
- The list of indicators and procedures for the calculations of these indicators;
- The requirements for presentation of the results in reporting and communication; and
- The requirements for the data necessary for the calculation.

3.4 In response to the challenge of ensuring consistency with the application of BS EN 15978, further work has been undertaken by organisations including the Royal Institute of Chartered Surveyors (RICS) and the Building Research Establishment (BRE), with the following references also being pertinent to this assessment:

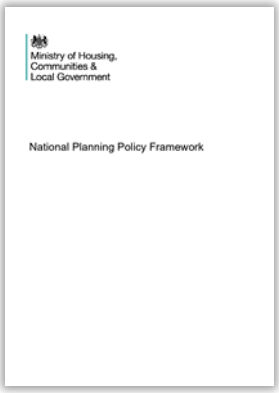
- RICS Professional Statement – Whole Life Carbon Assessment for the Built Environment 1st Edition (RICS; ISBN 978 1 78321 208 8, November 2017); and
- BRE Global Methodology for the Environmental Assessment of Buildings Using EN 15978:2011 (Building Research Establishment; ref PN 326 Rev 0.0; January 2018)

4. Planning Context

4.1 Local planning policy relevant to the assessment is considered below:

National Context

National Planning Policy Framework (2021)



4.2 The National Planning Policy Framework (NPPF) was updated in July 2021. Paragraphs 7, 8 and 10 of the revised NPPF include reference to the following:

7. "The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs. At a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being and environmental protection".

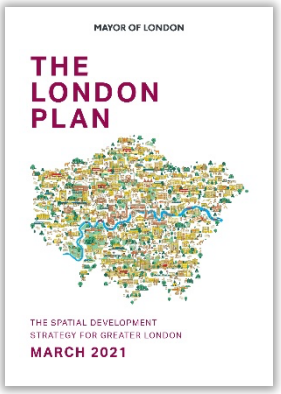
8. "Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

- *An economic objective - to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;*
- *A social objective - to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and*
- *An environmental objective - an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."*

10. "So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development"

London Context

London Plan (2021)



4.3 The London Plan is the overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The London Plan is part of the Development Plan and covers a range of planning issues. The presented policies provide a vision for how London should sustainably grow and develop in the future. Policies considered pertinent to this report are presented below:

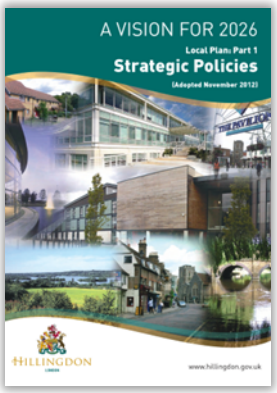
- Policy SI 2 (*Minimising* greenhouse *gas emissions*) - Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emission.

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

4.4 The guidance document explains how to prepare a WLC assessment which should accompany all referable planning applications in line with the London Plan Policy SI 2. The guidance follows BS EN 15978 using the RICS Professional Statement as the methodology for assessment.

Local Context

London Borough of Hillingdon Local Plan Part 1 - Strategic Policies (2012)



4.5 The Local Plan Part 1 sets out the overall level and broad locations of growth up to 2026. It comprises a spatial vision and strategy, strategic objectives, core policies and a monitoring and implementation framework with clear objectives for achieving delivery

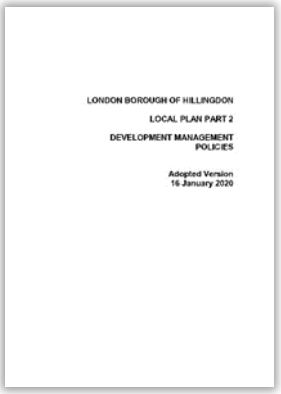
4.6 The following policies are considered pertinent to this report:

- Policy BE1 (*Built Environment*) - The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods. Includes reference to aligning with the carbon dioxide targets of the London Plan; and BREEAM.

- Policy EM1 (*Climate Change Adaptation and Mitigation*) - The Council will ensure that climate change mitigation is addressed at every stage of the development process.

- Policy EM11 (*Sustainable Waste Management*) - The Council will require all new development to address waste management at all stages of a development's life from design and construction through to the end use and activity on site, ensuring that all waste is managed towards the upper end of the waste hierarchy.

London Borough of Hillingdon Local Plan Part 2 - Development Management Policies (2020)



4.7 This Development Management Policies document forms part of Hillingdon's Local Plan Part 2. Its purpose is to provide detailed policies that will form the basis of the Council's decisions on individual planning applications.

4.8 The following policies are highlighted:

- Policy DMEI2 (*Reducing Carbon Emissions*) - All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

5. Specification of the Object of Assessment

5.1 The following section outlines the parameters by which the Whole Life-Cycle Carbon Assessment has been undertaken. Specification of the boundaries is necessary to ensure consistency of approach and comparison.

Spatial Boundaries

5.2 A Whole Life-Cycle Carbon Assessment should consider all building components and works relating to the project, including any external works within the site boundary. The site boundary needs to be in line with the definition and intended use of the built asset, including all contiguous land that is associated with the project and that supports its operations.

5.3 For the WLC assessment, the spatial boundary is consistent with the red-line site boundary presented in support of the application.

Building Physical Characteristics

5.4 This section outlines the building parts, elements, and components to be included in a Whole Life-Cycle Carbon Assessment. The physical characteristics are as described in schedule of accommodation and architect drawings and include:

- Redevelopment to provide a self-storage facility (Use Class B8)
- Associated car and cycle parking, refuse storage, landscaping and other associated works ancillary to the development.

5.5 In line with the RICS Professional Statement, new build projects assessed are considered to commence their development on a cleared, flat site for consistency purposes. Demolition works are often decoupled from new construction projects, hence the responsibility for any emissions arising from demolition is not necessarily solely attributable to the new build project.

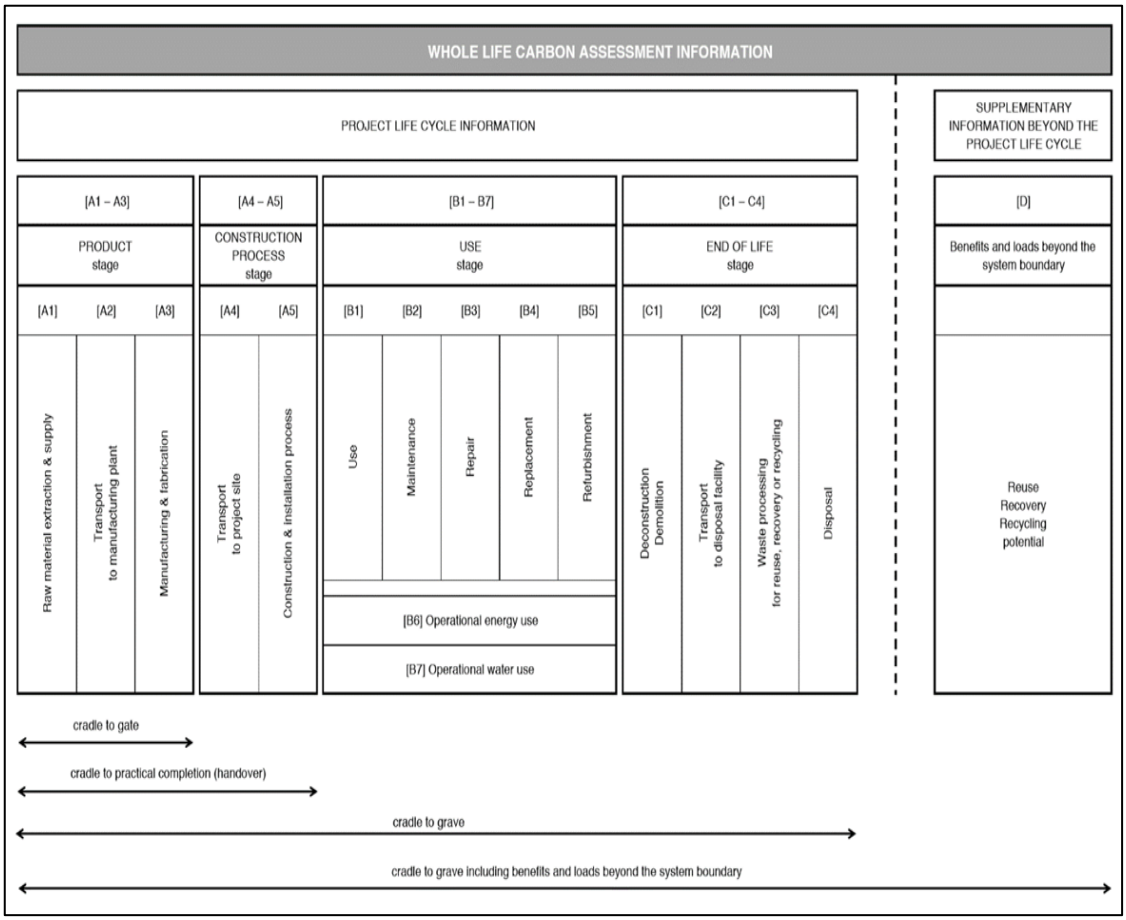
Reference Study Period

5.6 The Reference Study Period (RSP) to be used for the Whole Life-Cycle Carbon Assessment is defined by the RICS PS as being dependent on the nature of the development. Grove Crescent Road South is a residential scheme; however, RICS PS still gives reference to the number of years referred to under non-domestic standards; including BREEAM 2014 New Construction – Mat01 Life Cycle impacts; and LEED v.4 standards whereby a 60-year study period is specified. The RICS PS references to both the BREEAM and LEED standards are purely to ensure compatibility with other similar approaches. Furthermore, the acknowledgement of the 2014 version of BREEAM is due to the publishing date of the RICS PS; before the release of BREEAM New Construction 2018.

Life Cycle Stages - Overview

5.7 The stages are as presented in BS EN 15978:2011, the boundaries of which are all clearly defined to ensure consistency of approach and comparison between the whole life results for different projects.

Figure 5.1 Whole Life Cycle Stages (RICS PS adapt. of BS EN 15978:2011 stages)



5.8 Certain potential sources of carbon (e.g., transport emissions associated with the use stage) are outside the scope; and whilst these emissions might be picked up through other assessment (organisational carbon foot printing), they are not including within Whole Life-Cycle Carbon Assessment. This is because the WLC methodology is an assessment of the built environment only.

Units of Measurement

5.9 The units of measurement are reported in $kgCO_2$ equivalent ("$kgCO_{2e}$"). This is standard unit for measuring carbon footprints and expresses the impact of each different greenhouse gas in terms of the amount of CO_2 that would be required to create the same amount of warming. It therefore allows for the simultaneous assessment of multiple greenhouse gases.

Future Energy Projections

5.10 The energy sector is a major carbon emitter and will need to continue to decarbonise over time to be consistent with national policy targets. To enable consistency in the calculation of life cycle carbon impacts, EN15978 suggests that current practices shall apply to any future projections and does not allow for decarbonisation in the calculations. However, and in line with the RICS PS, it is important to provide a realistic estimate of the whole life carbon emissions and therefore a decarbonised future is presented separately to the non-decarbonised one. SAP10.2 carbon conversion factors have been used in this assessment.

6. Methodology

6.1 The Whole Life-Cycle Carbon Assessment was calculated using the One Click LCA software, utilising both the IMPACT compliant & BRE approved LCA calculation tools, with geometry being created and defined within IES VE 2022 and exported to the One Click tool.

6.2 The geometries of the building were modelled within IES VE 2022, based upon drawings provided by the architect and structures teams. Once the building's geometry had been modelled, materials were assigned to the building elements such as the floors, external walls, internal partitions, foundations, and roof.

6.3 The completed IES VE 2022 model was then imported into One Click LCA, where the appropriate datasets from the IMPACT database were automatically assigned to the model, along with their geometries.

6.4 IES VE 2022 does not allow the modelling of non-thermal elements, therefore elements such as the substructure, structural frame and hard landscaping were added manually into the model once it had been imported into One Click LCA.

Figure 6.1 IES Representation of the Site

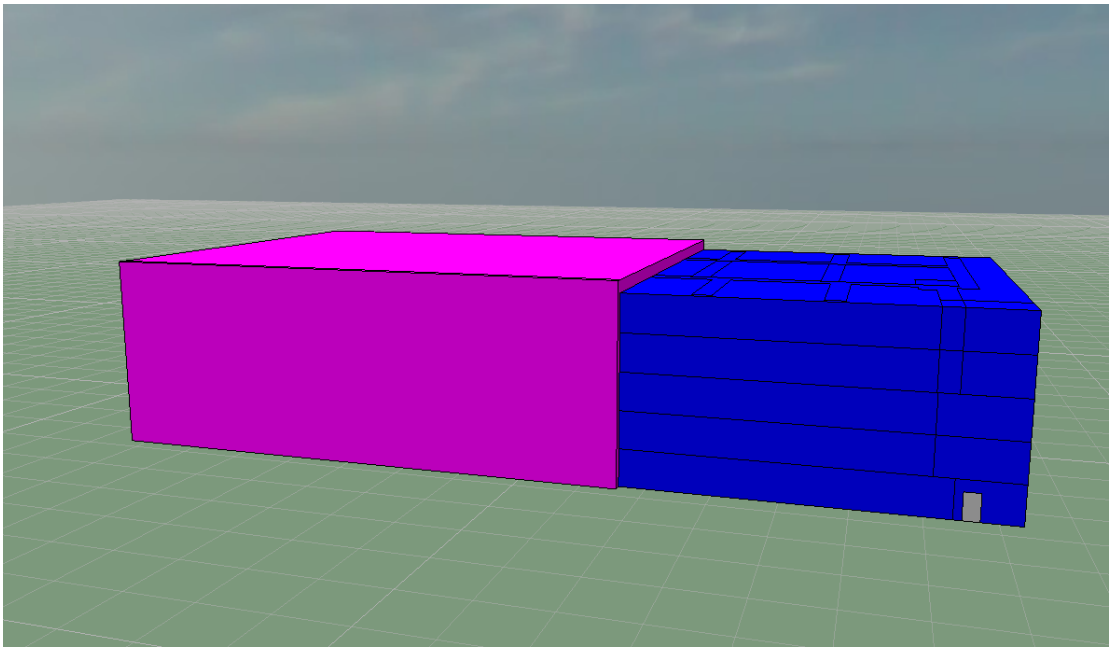


Table 6.1 WLC Primary Data Sources Summary

Lifecycle Stage		Data Source
Product Stage	A1: Raw Material Supply	IES-VE; One Click LCA database
	A2: Transport	One Click LCA database
	A3: Manufacturing	One Click LCA database

Construction Process Stage	A4: Transport to Building Site	One Click LCA database
	A5: Installation into Building	One Click LCA database
Use Stage	B1: Use / Application	One Click LCA database Submission Documents
	B2: Maintenance	One Click LCA database
	B3: Repair	One Click LCA database
	B4: Replacement	One Click LCA database
	B5: Refurbishment	One Click LCA database
	B6: Operational Energy Use	Building Regulations Part L Report
	B7: Operational Water Use	BSRIA BG9-2011 (Rules of thumb) Employment Density Guide 3rd
End of Life Stage	C1: Deconstruction / Demolition	One Click LCA database
	C2: Transport	One Click LCA database
	C3: Waste Processing	One Click LCA database
	C4: Disposal	One Click LCA database
Benefits & Loads Beyond the System Boundary	D: Reuse / Recovery / Recycling	One Click LCA database

7. Product Stage [A1-A3]

7.1 The product stage deals with the carbon emissions attributable to the cradle to gate processes; raw materials supply, transport, and manufacturing; and comprise:

- Raw Material Extraction & Supply [A1]
- Transport to Manufacturing Plant [A2]
- Manufacturing & Fabrication [A3]

7.2 The processes covered by [A1–A3] frequently occur in several steps, where components are manufactured and then transported to a further fabrication plant for assembly into a system; and all of these interim steps need to be taken into account.

7.3 The calculation for the carbon emissions associated with the product stage [A1-A3] requires the assignment of suitable embodied carbon factors to the given elemental material quantities, as follows:

[A1-A3] = Material quantity (a) x Material embodied carbon factor (b)

7.4 Given the early stage of assessment, technical specification is still indicative, therefore generic data, representative of standard, market average specifications have been used.

7.5 Environmental information for the product stage is defined in the product Environmental Product Declaration (EPD). But where no EPD is available, scenarios for products have been defined from cradle to gate modules according to EN15804.

7.6 The following table summarises the building materials assumptions:

Table 7.1 Building Materials

Resource	Quantity (kg)
Foundations & Substructure	
EPS Insulation, T: 10-2400 mm, 600 x 1200 mm, 0.031 W/m2K, 16 kg/m3 (EPS-gruppen	4,136
Ready-mix concrete, normal strength, generic, C32/40 (4600/5800 PSI) with CEM II/B-V, 20% fly ash content in cement (300 kg/m3; 18.7 lbs/ft3 total cement) (One Click LCA 2022)	744,480
Plastic vapour control layer, 0.2 mm (Tommen Gram)	190
Reinforcement steel (rebar), generic, 97% recycled content (typical), A615	27,926
Self levelling mortar, for floors, walls and overhead appl., 3-50 mm, 1400 kg/m3, Pericret (PCI Augsburg)	28,952
Ready-mix concrete, normal strength, generic, C32/40 (4600/5800 PSI) with CEM II/B-V, 20% fly ash content in cement (300 kg/m3; 18.7 lbs/ft3 total cement) (One Click LCA 2022)	294,507

Reinforcement steel (rebar), generic, 97% recycled content, A615	20,425
Vertical Structures and Façade	
Sandwich panel with glasswool insulation and double steel siding, U=0.35W/(m2K), 120.9mm (Total), 0.5mm (Outer sheet), 0.4mm (Liner sheet), 120mm (Insulation), 10.36kg/m2, 85.69kg/m3, Elite System 51.35 (Tata Steel Europe & Euroclad Group Ltd)	15,000
Structural hollow steel sections (HSS), cold rolled, generic, 10 % recycled content, circular, square and rectangular profiles, S235, S275 and S355	18,240
Gypsum plaster board, regular, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (2.20 lbs/ft2) (for 12.5 mm/0.49 in), 858 kg/m3 (53.6 lbs/ft3)	95,000
Water-borne interior paints, 1.36 kg/L, average coverage 8-10 m2/L, Biora, Ekora, Kolibri Sand, Paneelikattomaali, Ranch, Superlateksi, Tapettipohjamaali, Teknospro, Tela, Timantti, Trend (Teknos)	1,180
Structural steel profiles, generic, 60% recycled content, I, H, U, L, and T sections, S235, S275 and S355	12,190
Glass wool insulation panels, unfaced, generic, L = 0.031 W/mK, R = 3.23 m2K/W (18 ft2°Fh/BTU), 25 kg/m3 (1.56 lbs/ft3), (applicable for densities: 0-25 kg/m3 (0-1.56 lbs/ft3)), Lambda=0.031 W/(m.K)	11,015
Gypsum plaster board, regular, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (2.20 lbs/ft2) (for 12.5 mm/0.49 in), 858 kg/m3 (53.6 lbs/ft3)	95,000
Horizontal structures: beams, floor's, and roofs	
Sandwich panel with glasswool insulation and double steel siding, U=0.35W/(m2K), 120.9mm (Total), 0.5mm (Outer sheet), 0.4mm (Liner sheet), 120mm (Insulation), 10.36kg/m2, 85.69kg/m3, Elite System 51.35 (Tata Steel Europe & Euroclad Group Ltd)	11,000
Steel sheets, generic, 60% recycled content, S235, S275 and S355	8,100
Ready-mix concrete, normal-strength, generic, C30/37 (4400/5400 PSI), 0% recycled binders in cement (300 kg/m3 / 18.72 lbs/ft3)	2,018,400
Reinforcement steel (rebar), generic, 90% recycled content, A615	85,136
Structural steel profiles, generic, 60% recycled content, I, H, U, L, and T sections, S235, S275 and S355	90,720
Other structures and materials	
Ready-mix concrete, normal-strength, generic, C30/37 (4400/5400 PSI), 10% (typical) recycled binders in cement (300 kg/m3 / 18.72 lbs/ft3)	23,040
Reinforcement steel (rebar), generic, 90% recycled content, A615	958
Ready-mix concrete, normal-strength, generic, C30/37 (4400/5400 PSI), 10% (typical) recycled binders in cement (300 kg/m3 / 18.72 lbs/ft3)	67,200
Reinforcement steel (rebar), generic, 90% recycled content, A615	2,760
Porcelain WC kit (toilet and tank), 37.4 kg/unit, DURAVIT : Duraplus)	75
Porcelain sink, 29.6 kg/unit, 50 x 70 cm (SFISB)	59
Emulsion matt paint for allround interior use, Pigment: Lightfast Pigments, binder: PVA Copolymer emulsion , solvent: Water, 1.443 kg/l, 18m2/l, 0.16 kg/m2, Supermatt White, Almond White, Gardenia, Magnolia, Light Base, Medium Base (Dulux Trade)	680
Waterproof, protective, flexible coating, 1.5 kg/l, Lastogum (PCI Augsburg)	320

Tile adhesive, all round, for ceramics, 1-5 mm, 1400 kg/m3, Verlegemörtel (PCI Augsburg)	300
Ceramic wall tiles, 7.5 mm, 3000 kg/m2 (Seranit Granit Seramik)	5,112
Foam backed vinyl (PVC) flooring, heterogeneous, 2.6 mm, 1.8 kg/m2, TX Classic (Tarkett)	7,300
Aluminium framed windows, double leaf, 26.55 kg/m2 (SNFA)	66
Steel hallway entry door, DONNEE PAR DEFAUT (DED)	350
External areas and site elements	
Facing bricks, clay pavers and brick slips, 900-2500 kg/m3 (Bauen mit Backstein Zweischalige Wand Marketing)	2,538
Sand, compacted dry density, 1682 kg/m3	45,414
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	144,000
Building Technology	
Air heat pump, 2,2 kW, R410A	350
Electricity distribution system, cabling and central, for all building types, per m2 GFA	4,100
Drinking water supply piping network, per m2 GIFA (residential buildings	1,300
Sewage water drainage piping network, per m2 GIFA (factories and logistics buildings)	310
Heat distribution piping network, per m2 heated area, all building types	950
Solar panel photovoltaic system, EU average	3,600

Table 7.2 Product Stage [A1-A3] Emissions ($kgCO_{2e}$)

	A1-A3 Product Stage
1 Substructure	177,687
2.1 Frame	259,541
2.2 Upper floors	306,477
2.3 Roof	53,741
2.4 Stairs and Ramps	12,765
2.5 External walls	46,477
2.6 Windows and External Doors	3,425
2.7 Internal doors and Partitions	97,435
2.8 Internal doors	
3 Finishes	26,391
4 Fittings, furnishings & equipment's	
5 Services (MEP)	104,830
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	928
Other materials - TOTAL	
TOTAL kg CO_{2e}	1,089,697

8. Construction Process Stage [A4-A5]

8.1 Modules [A4] and [A5] respectively capture the emissions associated with the transportation of the materials and components from the factory gate to the project site and their assembly into a building.

Transport Emissions [A4]

8.2 Transport emissions must include all stages of the journey of the products following their departure from the final manufacturing plant to the project site, taking into account any interim stops at storage depots / and / or distribution centres.

8.3 Transport emissions are calculated as follows:

[A4] = Material or system mass (a) x Transport distance (b) x Carbon conversion factor (c)

8.4 For the purposes of this WLC assessment, the One Click LCA library dataset has been used and the following emissions have been calculated in relation to the selected materials.

Table 8.1 Transport to Site [A4] ($kgCO_{2e}$)

	A4 Transportation to Site
1 Substructure	8,388
2.1 Frame	459
2.2 Upper floors	16,102
2.3 Roof	68
2.4 Stairs and Ramps	720
2.5 External walls	46
2.6 Windows and External Doors	2
2.7 Internal doors and Partitions	527
2.8 Internal doors	
3 Finishes	61
4 Fittings, furnishings & equipment's	
5 Services (MEP)	322
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	837
Other materials - TOTAL	
TOTAL kg CO_{2e}	27,531

Construction – Installation Process Emissions [A5]

8.5 The carbon emissions arising from any on- or off-site construction-related activities must be considered in [A5]. This includes any energy consumption for site accommodation, plant use

and the impacts associated with any waste generated through the construction process, its treatment and disposal.

8.6 The RICS PS permits the use of an average figure of 1,400kgCO_{2e}/£100K of project value for building construction site emissions, in the absence of more specific information. This figure is taken from the BRE SMARTWaste KPIs and is based on the date of the publication, March 2015; and should therefore be adjusted to current value in accordance with CPI.

8.7 A similar approach is presented within One Click LCA whereby an average site impacts figure can be adopted based upon gross floor area and verified to the EN15804 standard. This accounts for a global warming potential of 30.34kgCO_{2e}/m2 before local compensation.

8.8 For the purposes of this WLC assessment, preference has been given to the One Click LCA approach.

Table 8.2 Site Operations [A5] (kgCO_{2e})

	A5 Site Operations
1 Substructure	9,642
2.1 Frame	8,726
2.2 Upper floors	13,823
2.3 Roof	5,845
2.4 Stairs and Ramps	580
2.5 External walls	7,070
2.6 Windows and External Doors	-
2.7 Internal doors and Partitions	9,750
2.8 Internal doors	
3 Finishes	4,162
4 Fittings, furnishings & equipment's	
5 Services (MEP)	927
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	24
Other materials - TOTAL	155,662
TOTAL kg CO_{2e}	216,210

9. Use Stage [B1-B7]

9.1 The use stage captures the carbon emissions associated with the operation of the built asset over its entire life cycle, from practical completion to the end of its service life. This includes any emissions relating to operational energy and water use as well as any embodied carbon impacts associated with maintenance, repair, replacement, and refurbishment of building components.

Use [B1]

9.2 The in-use module [B1] captures the emissions arising during the life of a building from its components; including any emissions arising from refrigerants, insulation blowing agents and paints; as well as accounting for the carbonation process in items containing exposed concrete and / or lime.

9.3 Carbon absorption potential by green roofs and facades should also be considered, although the absorption potential for areas <1,000m^2 is generally considered negligible.

Refrigerants

9.4 For the refrigerants, the WLC assessment has assumed a charge, this will need to be revisited later on in the design.

Carbonation

9.5 Cementitious materials, such as concrete, cement and mortar, absorb carbon dioxide when exposed to air. This process is the chemical reversal of the cement production process calcination phase. The amount of carbon dioxide absorbed depends on exposure of the material, duration of the exposure as well as the initial amount of cement.

9.6 The figures associated with the carbonisation have been generated through the OneClick LCA software and relate to the selection of materials (detailed above).

Vegetation Carbon Withdrawals

9.7 Vegetation carbon withdrawals have been modelled based upon the landscape drawings and details provided in the Design and Access statement.

9.8 It should be noted that removals associated with vegetation are not persistent and will be lost unless the project is set up in such a way to preserve vegetation at its eventual demolition.

Table 9.1 Use [B1] ($kgCO_{2e}$)

	B1 Use Phase
1 Substructure	-
2.1 Frame	-
2.2 Upper floors	-
2.3 Roof	-
2.4 Stairs and Ramps	-
2.5 External walls	-
2.6 Windows and External Doors	-
2.7 Internal doors and Partitions	-
2.8 Internal doors	-
3 Finishes	-
4 Fittings, furnishings & equipment's	-
5 Services (MEP)	56,701
6 Prefabricated buildings and building units	-
7 Work to existing building	-
8 External works	-
Other materials - TOTAL	-
TOTAL kg CO_{2e}	56,701

Maintenance [B2]

9.9 The [B2] module accounts for the carbon emissions arising from any activities relating to the maintenance processes, including cleaning, and any products used. It also includes any emissions from the energy and water use associated with these activities.

9.10 Emissions associated with maintenance are not calculated by the One Click LCA software on the basis that there are no meaningful data sources. Alternatively, the GLA suggests that for module B2 emissions, a total figure of 10 kgCO2e/m2 gross internal area (GIA) may be used to cover all building element categories, or 1 per cent of modules A1-A5, whichever is greater. This approach has been adopted to estimate emissions from maintenance in this assessment.

Table 9.2 Maintenance [B2] ($kgCO_{2e}$)

	B2 Maintenance
1 Substructure	-
2.1 Frame	-
2.2 Upper floors	-
2.3 Roof	-
2.4 Stairs and Ramps	-
2.5 External walls	-
2.6 Windows and External Doors	-
2.7 Internal doors and Partitions	-
2.8 Internal doors	-

3 Finishes	-
4 Fittings, furnishings & equipment's	-
5 Services (MEP)	51,483
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	
Other materials - TOTAL	
TOTAL kg CO_{2e}	51,483

Repair [B3]

9.11 Module [B3] is intended to take account of the carbon emissions arising from all activities that relate to repair processes and any products used. Typically, this would require data from facilities management / maintenance strategy reports, façade access and maintenance strategy, life cycle cost reports, O&M manuals, and professional guidance.

9.12 Repair data have been entered into the software for some of the materials selected. As no details are available yet for repair, the data inputted into the tool are based on assumptions of annual rates of repair. For example, it has been assumed that 1 in 50 windows at street level may be broken every 2 years.

9.13 The default information associated with other applicable materials, based on their Environmental Product Declaration (EPD), mean that their service life is a lot shorter and thus any emissions from repair works are likely already captured by other [B] modules. Examples include the finishes and coverings, such as paint and carpet tiles, which have a service life of ~10 years. Regardless, emissions associated with repair are not expected to be significant.

Repair [B3] ($kgCO_{2e}$)

	B3 Repair
1 Substructure	-
2.1 Frame	-
2.2 Upper floors	-
2.3 Roof	-
2.4 Stairs and Ramps	-
2.5 External walls	-
2.6 Windows and External Doors	2,066
2.7 Internal doors and Partitions	-
2.8 Internal doors	
3 Finishes	-
4 Fittings, furnishings & equipment's	
5 Services (MEP)	-
6 Prefabricated buildings and building units	
7 Work to existing building	

8 External works	-
Other materials - TOTAL	
TOTAL kg CO_{2e}	2,066

Material replacement and refurbishment [B4-B5]

9.14 Carbon emissions associated with the anticipated replacement of building components, including any emissions from the replacement process are captured under module [B4]. All emissions arising from the production, transportation to site and installation of the replacement items must be included. This extends to cover any losses during these processes as well as the carbon associated with component removal and end of life treatment.

9.15 Emissions from the replacement of items from the following building element groups should be reported: roof, external walls, windows and doors, finishes, fittings, furnishings & equipment, services.

9.16 Module [B5] must take into account any carbon emissions associated with any building components used in a refurbishment, including any emissions from refurbishment activities. All emissions arising from the production, transport to site and installation of the components used must be included. This includes any losses during these processes, as well as the carbon associated with their removal and end of life treatment.

9.17 The calculation of refurbishment should account for any material additions and variations, instead of like-for-like as in replacement.

9.18 It is assumed that items are being replaced on a like-for-like basis and full replacement (100%) of the items is assumed once the specified lifespan is reached.

9.19 Details for service life are automatically entered into the One Click LCA software for each of the selected building materials since it is typically quantified in the product's EPD. These emissions are accounted for in the B4 part of the lifecycle. As no refurbishment is planned for the building, it has been assumed that no change of use will occur during the service life of the project.

Table 9.3 Material replacement and refurbishment [B4-B5] ($kgCO_{2e}$)

	B4-B5 Material replacement and refurbishment
1 Substructure	
2.1 Frame	
2.2 Upper floors	
2.3 Roof	
2.4 Stairs and Ramps	
2.5 External walls	
2.6 Windows and External Doors	3,169

2.7 Internal doors and Partitions	9,878
2.8 Internal doors	
3 Finishes	82,739
4 Fittings, furnishings & equipment's	
5 Services (MEP)	193,364
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	
Other materials - TOTAL	
Site, energy and water	289,150
TOTAL kg CO_{2e}	3,169

Operational Energy Use [B6]

9.20 The operational carbon emissions arising from the energy use of building-integrated systems as projected and/or measured throughout the life cycle of the project must be reported under module [B6].

9.21 The operational emissions include the following:

- All emissions regulated under Part L of the Building Regulations - including space heating, hot water supply, cooling, lighting and auxiliary.
- Emissions from non-regulated building-integrated systems – including lifts, safety, securing and communications systems.
- Emissions from non-building-related systems – including ICT equipment, cooking appliances, specialist equipment – can represent a significant part of the total operational emissions and should be including where possible.
- Any impact from waste produced by operational energy use should also be considered including any treatment and transportation these might require.
- Where building operation requires fuel to be transported to the site (e.g., gas bottles, oil suppliers etc.) the transport emissions associated with the fuel delivered should be included.
- Any benefit from energy produced onsite and exported to the grid is covered within module [D].

9.22 The RICS PS states that the effect of the anticipated future grid decarbonisation should be accounted for when estimating the operational carbon impact over the life of the project. Consideration should also be given to the impact of climate change the potential affects this would have on heating and cooling demands over the life cycle.

Emissions Regulated Under Part L of the Building Regulations

9.23 An initial assessment of regulated emissions has been undertaken by Ensphere Group and is included as an appendix within the submitted energy report.

9.24 Emissions associated with the Building Regulations are assessed to be less than 1 tonne CO_2 per annum using the SAP10.2 carbon conversion factors. This equates to 2.1 tonnes over a 60-year time period.

Emissions from Non-regulated Building-integrated Systems

9.25 A number of sources of emissions are excluded from the Building Regulations, notably those associated with Equipment with lifts, safety, securing and communications systems, external lighting, and other equipment's etc. The Building Regulations report provides a figure for estimated unrelated energy use and this has been used as the basis for predicting this figure.

9.26 Emissions associated with the unregulated energy use are assessed to be 1.3 tonnes CO_2 per annum using the SAP10.2 carbon conversion factors. This equates to 80 tonnes over a 60-year time period.

Operational Water Use [B7]

9.27 All carbon emissions related to water supply and wastewater treatment, over the life cycle of the building (excluding water use during maintenance, repair, replacement, and refurbishment that are reported elsewhere), must be reported under module [B7].

9.28 Estimates on anticipated water consumption in the UK have been made based on the values provided in Table 22 of the BSRIA Rules of thumb – Guidelines for the building services, 5th edition for the respective building type, in the absence of project specific information at early design stages. The 'factories without canteen' category has been used as a proxy for maximum daily water consumption (40 litres per person). The Employment Density Guide (3rd edition) was also used to approximate the number of people working in the building. The [B8] Storage & Distribution density figure determined that the warehouse would accommodate approximately 55 people.

9.29 For the proposed development, emissions associated with operational water usage are estimated to be 33 tonnes CO_{2e} over the 60-year period.

10. End of Life Stage [C1 to C4]

10.1 The EoL stage commences when the built asset has reached the end of its life and will no longer be used. For the purposes of the whole life carbon assessment this is assumed to occur at the end of the reference study period of the building. The reference study period is used for consistency and comparability of results, irrespective of other factors which might determine the lifespan of the building (e.g., lease period).

10.2 Any emissions arising from decommissioning, stripping out, disassembly, deconstruction and demolition operations as well as from transport, processing and disposal of materials at the end of life of the project must be accounted for in module [C], which is subdivided as follows:

- deconstruction and demolition emissions [C1]
- transport emissions [C2]
- waste processing for reuse, recovery or recycling emissions [C3]
- disposal emissions [C4]

10.3 The carbon emissions arising from any on or off-site deconstruction and demolition activities, including any energy consumption for site accommodation and plant use, must be considered in [C1].

10.4 According to the RICS PS, an average rate of 3.4 $kgCO_{2e}/m^2$ GIA (rate from monitored demolition case studies in central London) based on aggregated data should be used in the absence of more specific information.

10.5 Any carbon emissions associated with the transportation of deconstruction and demolition arisings to the appropriate disposal site, including any interim stations, must be captured within module [C2].

10.6 The transport emissions for the discarded items should be calculated based on the following formula:

[C2] = Mass of waste to be transported (a) × Transport carbon factor (b) × Distance to disposal site (c)

10.7 The RICS PS outlines acceptable assumptions to be used in the absence of more specific data.

10.8 When materials and/or components are intended to be recovered and reused or recycled after the end of the life of the built asset, any carbon emissions associated with their treatment and processing prior to reaching the end-of-waste state must be included in module [C3].

10.9 For elements not expected to be recovered and repurposed but intended for final disposal either in landfill or incineration, an allowance for the emissions arising from their disposal must be included in [C4].

10.10 The RICS PS outlines acceptable assumptions to be used in the absence of more specific data.

10.11 Library data associated with the One Click LCA generates figures for the total C1-C4 emissions on the basis of the materials selected. The following has been calculated:

Table 10.1 Total End of Life Stages [C1-C4] ($kgCO_{2e}$)

	C1-C4 End of Life Stage
1 Substructure	14,402
2.1 Frame	4,409
2.2 Upper floors	10,050
2.3 Roof	776
2.4 Stairs and Ramps	446
2.5 External walls	612
2.6 Windows and External Doors	17
2.7 Internal doors and Partitions	4,865
2.8 Internal doors	-
3 Finishes	15,128
4 Fittings, furnishings & equipment's	-
5 Services (MEP)	220
6 Prefabricated buildings and building units	-
7 Work to existing building	-
8 External works	1,055
Other materials - TOTAL -	
TOTAL kg CO_{2e}	51,981

11. Benefits & Loads Beyond the System Boundary [D]

11.1 Module [D] covers any benefits or burdens accruing from the repurposing of elements discarded from the built asset, or any energy recovered from them beyond the project's life cycle. Module [D] is intended to provide a broader picture of the environmental impacts of a project by accounting for the future potential of its components when these are repurposed i.e., recovered and reused and/ or recycled. Module [D] captures the avoided emissions (or potential loads) from utilising repurposed items to substitute primary materials. Module [D] can be used as a metric for quantifying circularity and assessing future resource efficiency.

11.2 It is communicated separately as it occurs beyond the life cycle of the project under study and also bears high inherent uncertainty regarding the future treatment of building components. In the absence of more specific data, reliance is given to the data within the One Click LCA tool.

Table 11.1 Benefits and Loads Beyond the System Boundary [D] ($kgCO_{2e}$)

	D Benefits and Loads Beyond the System Boundary
1 Substructure	-42533.34
2.1 Frame	-120027.99
2.2 Upper floors	-67590.98
2.3 Roof	-12956.52
2.4 Stairs and Ramps	-2980.07
2.5 External walls	-7606.02
2.6 Windows and External Doors	-1806.71
2.7 Internal doors and Partitions	-11574.76
2.8 Internal doors	
3 Finishes	-58102.95
4 Fittings, furnishings & equipment's	
5 Services (MEP)	-2301.5
6 Prefabricated buildings and building units	
7 Work to existing building	
8 External works	-10.46
Other materials - TOTAL	
TOTAL kg CO_{2e}	-327491.3

12. Whole Lifecycle Carbon Assessment Results

12.1 The following presents the project Whole Life-Cycle Carbon Assessment according to RICS methodology and EN 15978.

Table 12.1 Whole Life Carbon Assessment ($kgCO_{2e}$)

	Biogenic Carbon	A1-A3	A4	A5	B1	B2	B3	B4-B5	B6	B6	B7	C1-C4	D (*)	TOTAL
0.1 Toxic Mat.	0													
0.2 Demolition	0													
0.3 Supports	0													
0.4 Groundworks	0													
0.5 Diversion	0													
1 Substructure	0	177,687	8,388	9,642			-					14,402	-42533.34	210,119
2.1 Frame	0	259,541	459	8,726			-					4,409	-120027.99	273,135
2.2 Upper Floors	0	306,477	16,102	13,823			-					10,050	-67590.98	346,452
2.3 Roof		53,741	68	5,845			-					776	-12956.52	60,430
2.4 Stairs & Ramps	0	12,765	720	580			-					446	-2980.07	14,510
2.5 Ext. Walls		46,477	46	7,070			-					612	-7606.02	54,205
2.6 Windows & Ext. Doors	0	3,425	2	-			2,066	3,169				17	-1806.71	8,679
2.7. Int. Walls & Partitions		97,435	527	9,750			-	9,878				4,865	-11574.76	122,455
2.8 Int. Doors												-		
3 Finishes	0	26,391	61	4,162			-	82,739				15,128	-58102.95	128,482
4 Fittings, furnishings & equipment's												-		
5 Services (MEP)	0	104,830	322	927	56,701	51,483	-	193,364	2,105	80,498	33,359	220	-2301.5	523,808
6 Prefabricated	0											-		
7 Existing bldg	0											-		

8 Ext. works	0	928	837	24			-					1,055	-10.46	2,844
Unclassified / Other	0			155,662								-		155,662
TOTAL kg CO2e	**0**	1,089,697	27,531	216,210	56,701	51,483	2,066	289,150	2,105	80,498	33,359	51,981	-327491.3	1,900,781

(*) Module D is not included in totals.

13. Summary

13.1 A Whole Life-Cycle Carbon Assessment has been undertaken for a proposed development at Uxbridge Road, Hayes, UB4 0HD.

13.2 The assessment has been undertaken on the basis of information available at RIBA Stage 2 of the design.

13.3 Consideration has been given to the planning policy requirements, in particular Policy SI2 (*Minimising Greenhouse Gas Emissions*) of the London Plan; as well as the GLA's Whole Life-Cycle Carbon Assessments guidance.

13.4 The RICS Professional Statement - Whole Life Carbon Assessment for the Built Environment 1st Edition (RICS; ISBN 978 1 78321 208 8; November 2017); and BRE Global Methodology for the Environmental Assessment of Buildings Using EN 15978:2011 (Building Research Establishment; ref: PN 326 Rev 0.0; January 2018) have also been considered.

13.5 The assessment has reviewed WLC over a 60-year period, in line with the recommended RICS approach. This identified total WLC emissions of 1,900,781 kgCO2e.

13.6 The key lifecycle stages responsible for these emissions are [A1-A3] Materials Emissions (1,089,697 kg CO2e), the [B4] Material replacement (289,150 kg CO2e) and the [B6] Operational Energy Use (82,604 kg CO2e).

14. Recommendations

14.1 The following comprises a series of recommendations to assist with further reducing the carbon emissions associated with the proposed development.

14.2 The Whole Life-Cycle Carbon Assessment has identified the following key areas as being the most significant contributors to emissions:

[A1-A3] Product Stage

14.3 These were assessed to represent 1,089,697 $kgCO_{2e}$, equating to roughly 57% of the total. These emissions are largely associated with the material choices associated with the substructure, superstructure, and external works; where decisions are also influenced by factors such as structural performance, cost and aesthetics.

14.4 There may be scope to investigate alternatives with a lower carbon footprint; however, given the nature of the proposed development, the potential for significant reductions may be limited. Nevertheless, it is recommended that material options be revisited as the detail of the design development to review the potential extent of savings.

[B4-5] Material replacement and refurbishment

14.5 Material replacement and refurbishment emissions were assessed at 289,150 kgCO2e, roughly 15% of the total. These emissions are associated with the estimated lifespans associated with the selected materials and it may be feasible to identify more resilient materials products with longer lifespans.

[B6] Operational Energy Use

14.6 Operational energy use emissions were assessed at 82,604 kgCO2e (regulated and unregulated); representing 4% of the total.

14.7 Operational energy use is expected to contribute significantly to emissions over the buildings predicted lifetime, this figure may not however fully account for future grid decarbonisation in the UK over the next 60 years as it is based on current (SAP10.2) carbon conversion factors and will likely steadily reduce over time.

Offsetting

14.8 Acknowledging that it is not always feasible to completely eradicate WLC emissions through design decisions, consideration could be given to the potential for offsetting the impacts through abatement measures elsewhere and / or contributions to facilitate such abatements (e.g., green tariff electricity).

Appendices

A. Site Plan


Paddington Branch
Grand Union Canal
Bond Const & LB Bdy
CC
7 to 9
51
ESS
7465
18000
AR C
NOTES
ORIGINAL A1
All levels and dimensions to be checked on site prior to construction / fabrication; report discrepancies immediately.
Do not scale dimensions from this drawings.
This drawing is copyright protected.
REVISION
A 230622 Redrawn AF
Visitor Parking: 4 x Car space (1 of which is Accessible and all electrical charging)
Customer Parking: 35 x Car space (2 of which are Electrical Charge points)
Van Parking: A van can utilize 2 parallel parking bays
EV Electrical Car "Twin" charging point
Bicycle Parking: 4 long stay
4 short stay
2 Cargo Bikes
Refuse Requirement = 0.1 sqm
Actual Refuse Store = 11m2
Calculation: Total back of house/shop area = 57m2 Storage area Req @ 2 m2 / 1000m2
Sum: 57/1000 x 2 = 0.114m2
LEGEND: Surface Finishes
Pavement (Highways Land)
Proposed Soft Landscaping Area
Please refer to landscaping drawing for more details
N
Site Boundary - 8196 msq
SCALE 1:250
0 2 4 6 8 10m
SCALE 1:250
DATE Jun'22
DRAWN AF
CHECKED DA
PROJECT
SHURGARD UK
UK04 - HAYES
LONDON UB4 0HD
DRAWING
Site Plan
As Proposed
Threesixty Architecture
10 MONTROSE STREET
GLASGOW
G1 1RE
t 0141 229 7575
www.360architecture.com
DRAWING No.
21065GA-D-001A

B. Key Local Planning Policy Requirements

London Planning Policy Framework

London Plan (2021)

Policy SI 2 Minimising greenhouse gas emissions

A. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

   1) be lean: use less energy and manage demand during operation

   2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

   3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

   4) be seen: monitor, verify and report on energy performance.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

   1) through a cash in lieu contribution to the borough's carbon offset fund, or

   2) off-site provided that an alternative proposal is identified and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F. Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Local Planning Policy Framework

Local Plan Part 1 - Strategic Policies (2012)

Policy BE1: Built Environment

The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new developments should:

1. Achieve a high quality of design in all new buildings, alterations, extensions and the public realm which enhances the local distinctiveness of the area, contributes to community cohesion and a sense of place;

2. Be designed to be appropriate to the identity and context of Hillingdon's buildings, townscapes, landscapes and views, and make a positive contribution to the local area in terms of layout, form, scale and materials and seek to protect the amenity of surrounding land and buildings, particularly residential properties;

3. Be designed to include "Lifetime Homes" principles so that they can be readily adapted to meet the needs of those with disabilities and the elderly, 10% of these should be wheelchair accessible or easily adaptable to wheelchair accessibility encouraging places of work and leisure, streets, neighbourhoods, parks and open spaces to be designed to meet the needs of the community at all stages of people's lives;

4. In the case of 10 dwellings or over, achieve a satisfactory assessment rating in terms of the latest Building for Life standards (as amended or replaced from time to time);

5. Improve areas of poorer environmental quality, including within the areas of relative disadvantage of Hayes, Yiewsley and West Drayton. All regeneration schemes should ensure that they are appropriate to their historic context, make use of heritage assets and reinforce their significance;

6. Incorporate a clear network of routes that are easy to understand, inclusive, safe, secure and connect positively with interchanges, public transport, community facilities and services;

7. Improve the quality of the public realm and provide for public and private spaces that are attractive, safe, functional, diverse, sustainable, accessible to all, respect the local character and landscape, integrate with the development, enhance and protect biodiversity through the inclusion of living walls, roofs and areas for wildlife, encourage physical activity and where appropriate introduce public art;

8. Create safe and secure environments that reduce crime and fear of crime, anti-social behaviour and risks from fire and arson having regard to Secure by Design standards and address resilience to terrorism in major development proposals;

9. Not result in the inappropriate development of gardens and green spaces that erode the character and biodiversity of suburban areas and increase the risk of flooding through the loss of permeable areas;

10. Maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants. The Council will require all new development to achieve reductions in carbon dioxide emission in line with the London Plan targets through energy efficient design and effective use of low and zero carbon technologies. Where the required reduction from on-site renewable energy is not feasible within major developments, contributions off-site will be sought. The Council will seek to merge a suite of sustainable design goals, such as the use of SUDS, water efficiency, lifetime homes, and energy efficiency into a requirement measured against the Code for Sustainable Homes and BREEAM. These will be set out within the Hillingdon Local Plan: Part 2- Development Management Policies Local Development Document (LDD). All developments should be designed to make the most efficient use of natural resources whilst safeguarding historic assets, their settings and local amenity and include sustainable design and construction techniques to increase the re-use and recycling of construction, demolition and excavation waste and reduce the amount disposed to landfill;

11. In the case of tall buildings, not adversely affect their surroundings including the local character, cause harm to the significance of heritage assets or impact on important views. Appropriate locations for tall buildings will be defined on a Character Study and may include parts of Uxbridge and Hayes subject to considering the Obstacle Limitation Surfaces for Heathrow Airport. Outside of Uxbridge and Hayes town centres, tall buildings will not be supported. The height of all buildings should be based upon an understanding of the local character and be appropriate to the positive qualities of the surrounding townscape.

Support will be given for proposals that are consistent with local strategies, guidelines, supplementary planning documents and Hillingdon Local Plan: Part 2- Development Management Policies.

Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.

2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.

3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.

4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.

5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.

6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.

7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals.

8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricty and a greater use of waste as a resource.

9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.

11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.

12. Giving preference to development of previously developed land to avoid the loss of further green areas.

13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks.

14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.

Policy EM11: Sustainable Waste Management

The Council will aim to reduce the amount of waste produced in the Borough and work in conjunction with its partners in West London, to identify and allocate suitable new sites for waste management facilities within the West London Waste Plan to provide sufficient capacity to meet the apportionment requirements of the London Plan which is 382 thousand tonnes per annum for Hillingdon by 2026.

The Council will require all new development to address waste management at all stages of a development's life from design and construction through to the end use and activity on site, ensuring that all waste is managed towards the upper end of the waste hierarchy.

The Council will follow the waste hierarchy by promoting the reduction of waste generation through measures such as bioremediation of soils and best practice in building construction. The Council will promote using waste as a resource and encouraging the re-use of materials and recycling. The Council will also support opportunities for energy recovery from waste and composting where appropriate. The Council will safeguard existing waste sites unless compensatory provision can be made.

The Council will seek to maximise the use of existing waste management sites through intensification or co-location of facilities.

Local Plan Part 2 - Development Management Policies (2020)

Policy DMEI 2: Reducing Carbon Emissions

A. All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B. All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C. Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

C. LCA Details

One Click LCA

One Click LCA is specialised software developed by Bionova Ltd, that provides the means to generate quick and accurate building level Lifecycle Assessments using designs imported from tools such as Revit, IFC (BIM), Excel, IESVE, energy models (gbXML).

Further, it provides access to one of the largest LCA database's currently available with Environmental Product Declarations (EPD) from manufacturers as well as generic materials.

There are a number of calculation tools available within the One Click LCA tool, for the purposes of this LCA the following were utilised:

- LCA for BREEAM UK – The official BRE-approved LCA in compliance with all current BREEAM UK versions, it is used to calculate the different material options for the Superstructure, Substructure and Hard landscaping.
- LCA for BREEAM UK IMPACT-compliant – This is an IMPACT-compliant LCA application according to IMPACT v5, this is used to produce the baseline LCA for the superstructure as required by the Mat01 BREEAM criteria.

IMPACT

IMPACT is a specification and database for use by software developers to incorporate into their tool, enabling a consistent Life Cycle Assessment. IMPACT compliant calculation tools work by allowing the user to attribute environmental information to drawn or scheduled items in the BIM (For the purposes of this LCA the imported IESVE data model). The quantity information imported within the BIM is multiplied by the environmental impact and/or costs 'rates' to produce an overall impact and cost for the whole (or selected part) of the design.

For the purposes of this LCA an IMPACT compliant calculation tool available through One Click LCA has been used to generate an environmental benchmark for comparison with the BREEAM LCA benchmarks.

Environmental Product Declarations (EPD)

An environmental product declaration or EPD is a document which is used to quantifiably demonstrate the environmental performance of a product. The European Standard for the generation of environmental product declarations for construction products is EN 15804 and was published by the CEN Technical Committee for the sustainability of construction works (CEN TC350 in 2012.)

EPD are generated based on data obtained through Life Cycle Assessment (LCA), with the LCA being performed using a peer-reviewed Product Category Rules (PCR) document in line with EN 15804, ISO 14025, and other related intranational standard.

EN15804:2012 & Life cycle assessment scope and system boundaries

EN 15804:2012 + A1:2013 'Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products' is a European standard that provides core product category rules (PCR) for Type III environmental declarations for any construction product and construction service. The core PCR defines the parameters to be declared and the way in which they are collated and reported, describing which stages of a product's life cycle are considered in the PED and which processes are to be included in the life cycle stages. Further information can be found on the European Committee for Standardisation's website.

Further detailed explanation of the life cycle stage and analysis score of the EN 15804 standard are as follows:

Product Stage	Description
A1-A3 Construction Materials	Raw material supply (A1) includes emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed. Loss of raw material and energy are also considered. Transport impacts (A2) include exhaust emissions resulting from the transport of all raw materials from suppliers to the manufacturer's production plant as well as impacts of production of fuels. Production impacts (A3) cover the manufacturing of the production materials and fuels used by machines, as well as handling of waste formed in the production processes at the manufacturer's production plants until end-of-waste state.
A4 Transportation to site	A4 includes exhaust emissions resulting from the transport of building products from manufacturer's production plant to building site as well as the environmental impacts of production of the used fuel.
A5 Construction/installation process	A5 covers the exhaust emissions resulting from using energy during the site operations, the environmental impacts of production processes of fuel and energy and water as well as handling of waste until the end-of-waste state.
B1-B5 Maintenance and material replacement	The environmental impacts of maintenance and material replacements (B1-B5) include environmental impacts from replacing building products after they reach the end of their service life. The emissions cover impacts from raw material supply, transportation and production of the replacing new material as well as the impacts from manufacturing the replacing material as well as handling of waste until the end-of-waste state.
B6 Energy use	The considered use phase energy consumption (B6) impacts include exhaust emissions from any building level energy production as well as the environmental impacts of production processes of fuel and externally produced energy. Energy transmission losses are also considered.

B7 Water use	The considered use phase water consumption (B7) impacts include the environmental impacts of production processes of fresh water and the impacts from wastewater treatment.
C1-C4 Deconstruction	The impacts of deconstruction include impacts for processing recyclable construction waste flows for recycling (C3) until the end-of-waste stage or the impacts of pre-processing and landfilling for waste streams that cannot be recycled (C4) based on type of material. Additionally, deconstruction impacts include emissions caused by waste energy recovery.
D External impacts/end-of-life benefits	The external benefits include emission benefits from recycling recyclable building waste. Benefits for re-used or recycled material types include positive impact of replacing virgin-based material with recycled material and benefits for materials that can be recovered for energy cover positive impact for replacing other energy streams based on average impacts of energy production.

D. General Notes

The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Ensphere Group Ltd for inaccuracies in the data supplied by any other party.

The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

No site visits have been carried out, unless otherwise specified.

This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in guidance may necessitate a re-interpretation of the report in whole or in part after its original submission.

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Ensphere Group Ltd
52 Grosvenor Gardens
London, SW1W 0AU
+44 (0) 20 7846 9040
www.enspheregroup.com