

WHOLE LIFE-CYCLE CARBON ASSESSMENT

9.543 – 30-36 CLARENDON ROAD, LONDON, N8 0DJ

17/10/2022 by AJ, reviewed by JS

EXECUTIVE SUMMARY

A Whole Life-Cycle Carbon (WLC) assessment has been undertaken for the proposed development at the Jessica Buttons site within the London Borough of Haringey. The WLC assessment has been carried out in accordance with the latest published GLA *Whole Life-Cycle Carbon Assessments Guidance (March 2022)*. All WLC life-cycle stages are presented in the image below.

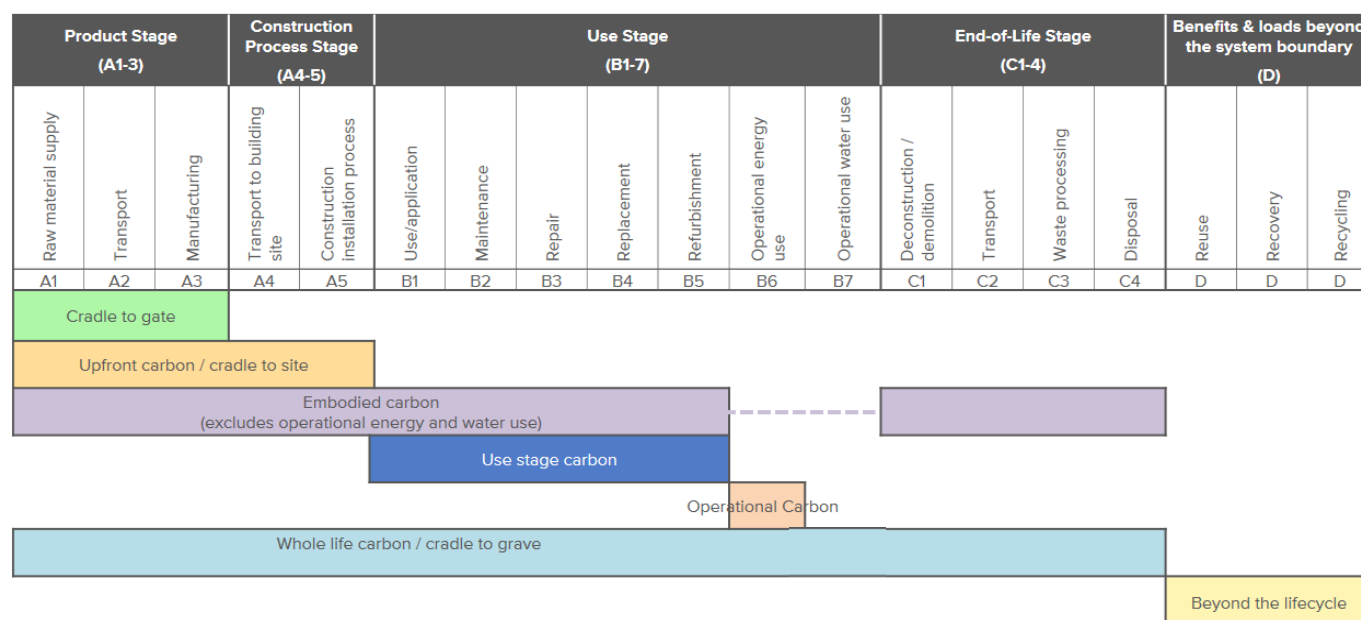


Figure 1: Life-cycle stages (modules) according to EN 15978 and terminology of carbon emissions scopes.

The estimated Whole Life-Cycle Carbon emissions of the proposed development are shown in the table below. Table 1 shows the results for estimated WLC assessment – current status of the electricity grid with SAP10 carbon factors, which is the scenario that was chosen to form the basis of design decisions.

Table 1: Estimated WLC emissions

	Module A1-A5	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO ₂ e	-237,024	2,712,811	1,137,481	3,166,207	556,898
TOTAL kg CO ₂ e/m ² GIA	-55	633	265	738	130

INTRODUCTION

As buildings become more energy efficient, operational carbon emissions will make up a smaller proportion of a development's WLC emissions. It is therefore becoming increasingly important to calculate and reduce carbon emissions associated with other aspects of a development's life-cycle; namely, embodied carbon emissions and unregulated emissions (all operational energy uses not covered by Building Regulations, for example cooking and small power).

SITE DESCRIPTION

The current scheme proposes to bring forward the Jessica Button Site in the north of the site for development independent of the other land, but within the master plan approach for the wider site, in order to ensure that any development does not prevent the future development of the adjoining land.

The proposed scheme for the Jessica Button site is a part two, part six, part eight and part eleven storey scheme, with basement, comprising 51 residential units and approximately 550 sqm of commercial floorspace at basement and ground floor level. The scheme's height drops down from west to east, to reflect the scale of properties on Hornsey Park Road. with the highest element in the north-east.

Commercial floorspace is provided at basement level (indicative units of 50 sqm, 141 sqm and 112sqm sqm are shown) and at ground floor level, two additional units (145 and 104sqm) providing a total of 552 sqm. This is slightly below the existing 595 sqm of employment floorspace on the site, but it is anticipated that the number of employees will increase and this will be set out in the Economic Impact Assessment which will accompany the planning application. Previously, for the comprehensive scheme, the number of current jobs for the wider site (18) was increased to 83 jobs and in addition, 346 construction jobs were created.

A mix of unit sizes is provided, comprising 19 no. 1-bed (37.3%), 26 no.-2-bed (51%) and 6 no. 3-bed units (11.8%). The proposed mix reflects the character and location of the site.

Six affordable units are provided at first floor level, a mix of four affordable rent and two intermediate units at second floor level and a mix of five intermediate and one private unit at third floor. Units on the fourth to eleventh floor are private.

35% of units by hab room will be affordable, as shown by the breakdown below:

- Affordable rent - 29 hab rooms (21%);
- Intermediate – 20 hab rooms (14%); and
- Private - 91 hab rooms (65%).

All units have their own private amenity space and three communal areas (incorporating play space and seating areas) are proposed at roof level and at the sixth and eighth floor as follows:

- Sixth floor – comprising 89sqm of play space for 0-4 year olds and communal amenity garden;
- Eighth floor – 64 sqm of play space for 5-11 year olds and communal amenity garden;
- Roof – 197 sqm of communal amenity area.

Cycle parking is provided at basement and ground level and will be provided to London Plan standards. Plant areas are provided within the basement and at roof level. Refuse bins would be provided at ground floor level, in the north-west of the building. Separate bin storage is provided for the different tenures and for the commercial floorspace.

The scheme will be car free. Disabled parking will be provided at 3% (two spaces), which will be provided on site at the south-east of the building. Servicing of the building will be from the west of the building.

An open space will be created to the south of the new building in order to separate it from the new buildings to the south, which would incorporate the new cultural centre.

POLICY FRAMEWORK

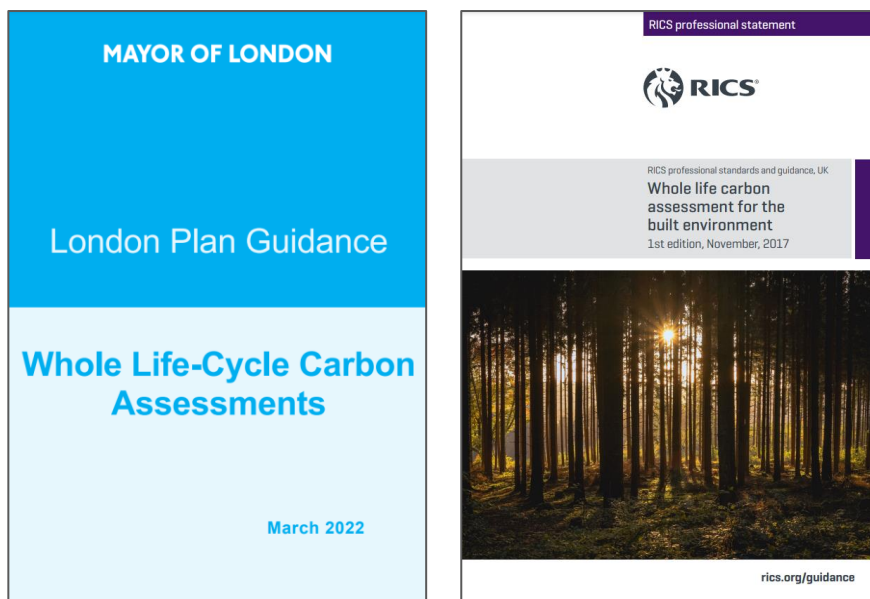
The new London Plan (March 2021) has included under Policy SI2 Minimising greenhouse gas emissions, a requirement for a WLC Assessment for all referable development proposals.

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.

The GLA has also published an updated London Plan Guidance report on Whole Life-Cycle Carbon Assessments (March 2022), which explains how to prepare a WLC assessment for planning applications. The guidance outlines when applicants are required to take action, this is as follows:

- Pre-application
- Stage 1 submission (i.e. RIBA Stage 2/3)
- Post-construction (i.e. upon commencement of RIBA Stage 6 and prior to the building being handed over, if applicable. Generally, it would be expected that the assessment would be received three months post-construction)

The GLA has also published a WLC assessment template which provides separate tabs detailing the information that should be submitted at each stage.



METHODOLOGY

The methodology followed in preparing this report is in line with the GLA WLC Assessments Guidance (March 2022) and the RICS professional statement titles 'Whole life carbon assessment for the built environment' (November 2017), which follows the European standard EN 15978.

The GLA's WLC assessment template has been filled in for the Detailed Planning stage. The Detailed Planning tab describes the design principles adopted in the scheme to reduce the WLC of the development. This report summarises the actions taken during Stage 1 submission (detailed application stage). This report should be read in conjunction with the WLC Assessment Template, which has been submitted as part of this planning application. The applicant recognises that the WLC calculations presented in this report will need to be revisited and if appointed, amended at post-construction stage (upon commencement of RIBA Stage 6).

LIFE-CYCLE STAGES

The life-cycle stages covered by the RICS methodology refer to EN 15978, which includes a modular approach to a built asset's life-cycle, breaking it down into different stages, as shown in Table 1. The four main modules are Product stage [A1 – A3], Construction Process stage [A4 – A5], Use stage [B1 – B7] and End of Life stage [C1 – C4]. Module D consists of the potential environmental benefits or burdens of materials beyond the life of the project, this is usually reported separately to the cradle to grave modules [A – C].

Table 2 shows the life-cycle stages that were considered for the assessment and the assumptions made for some stages due to limitations of the software used.

Table 2: Life-cycle stages.

Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage				Benefits and loads beyond the system boundary		
Raw material supply	Transport	Manufacturing	Transport to building site	Installation into building	Use/application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2*	B3†	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓

* B2 has been estimated by extrapolating the results of B3 assuming these correspond to 25% of B2 emissions as indicated in the RICS PS.

† B3: a repair/year% has been added for some building components (windows, MEP, finishes, and plasterboard).

BUILDING ELEMENTS

The WLC assessment covers all building elements listed in Table 4 (where applicable). Material quantities have been provided by Dexter Moran Associates. A minimum of at least 95% of the cost allocated to each building element category has been accounted for where information has been given in line with GLA policy.

Table 3: Building elements as per RICS NRM.

Group	Building Element	Applicable	Included
0. Demolition & facilitating works	0.1. Toxic / hazardous / contaminated material treatment	Yes	Yes
	0.2. Major demolition works	Yes	Yes
	0.3. & 0.5. Temporary / enabling works	No	No
	0.4. Specialist groundworks	No	No
1. Substructure	1.1. Substructure	Yes	Yes
2. Superstructure	2.1. Frame	Yes	Yes
	2.2. Upper floors incl. balconies	Yes	Yes
	2.3. Roof	Yes	Yes
	2.4. Stairs & ramps	Yes	Yes
	2.5. External walls	Yes	Yes
	2.6. Windows & external doors	Yes	Yes
	2.7. Internal walls & partitions	Yes	Yes
	2.8 Internal doors	Yes	Yes
3 Finishes	3.1 Wall finishes	Yes	Yes
	3.2 Floor finishes	Yes	Yes
	3.3 Ceiling finishes	Yes	Yes
4 Fittings, furnishings & equipment	4.1 Fittings, furnishings & equipment	Yes	Yes
5 Building services / MEP	5.1–5.14 Services	Yes	Yes
6 Prefabricated Buildings and Building Units	6.1 Prefabricated buildings and building unit	No	No
7 Work to existing building	7.1 Minor demolition and alteration works	No	No
8 External works	8.1 Site preparation works	No	No
	8.2 Roads, paths, pavings and surfacings	Yes	Yes
	8.3 Soft landscaping, planting, and irrigation systems	Yes	Yes
	8.4 Fencing, railings, and walls	No	No
	8.5 External fixtures	No	No
	8.6 External drainage	No	No
	8.7 External services	No	No
	8.8 Minor building works and ancillary buildings	No	No

SOFTWARE TOOLS

eToolLCD software was used to model life-cycle impacts of the project. eToolLCD uses third party background processes aggregated as mid-point indicators and stored in a number of libraries within the software which are coupled with algorithms and user inputs to output the environmental impact assessment. A map of user inputs, data sources and algorithms (outputs) is given in Figure 2.

eToolLCD is compliant with International Standards 14040 and 14044, and European Standard EN 15978; it is listed in the GLA WLC Assessments Guidance (March 2022), Appendix 1 as an acceptable/approved tool for whole life carbon calculations.

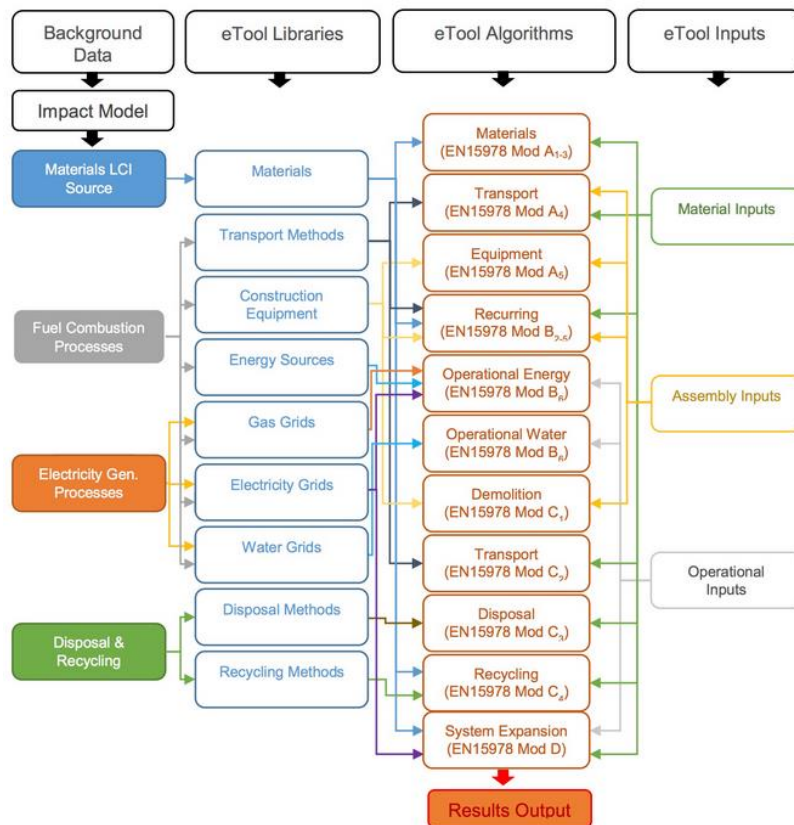


Figure 2: Map of eTool user inputs, data sources and algorithms

MATERIALS & PRODUCTS

WLC calculations have been carried out using:

- Type III environmental declarations (EPDs and equivalent) and datasets in accordance with BS EN 15804; and,
- EPDs and datasets in accordance with ISO 14025 and ISO 14040/44.

Sequestered (biogenic) carbon, in particular from the use of timber products, has been reported separately for A1-A3 stages.

Embodied carbon is difficult to calculate for many MEP systems due to a lack of available data. Where manufacturer specific data is not available figures for embodied carbon have been taken from the closest matching system within the eTool database. In cases where there are no comparable systems embodied carbon has been calculated based on the key materials used to manufacture the equipment, by weight. For the present assessment results were derived from best assumptions based on the type of development and should be updated at next design stage once MEP specifications have been produced.

GRID DECARBONISATION

As per the updated GLA WLC Assessments Guidance (March 2022), the decarbonisation assumptions are not required to account for in the WLC assessment as at present the available data is not reliable to do so accurately for embodied carbon emissions.

PRELIMINARY DISCUSSIONS

A workshop to discuss WLC reduction principles was undertaken with the design team including representatives from Architecture. The summary of the key principles applicable to the development are summarised in the Detailed Planning tab of the GLA WLC Assessment template accompanying this design note.

RESULTS

ESTIMATED WLC ASSESSMENT

The Estimated WLC assessment results are shown in Table 4 and Figure 3. This shows that the majority of carbon emissions (42%) are associated with Module B6-B7 with Module A1-A5 contributing the second highest amount at 36% of WLC emissions.

Table 4: Estimated WLC emissions Assessment

Estimated WLC emissions Assessment	Sequestered (biogenic) carbon	A1-A5	B1-B5	B6-B7	C1-C4	Module D
TOTAL kg CO ₂ e	-237,024	2,712,811	1,137,481	3,166,207	556,898	642,722
TOTAL kg CO ₂ e/m ² GIA	-55	633	265	738	130	150

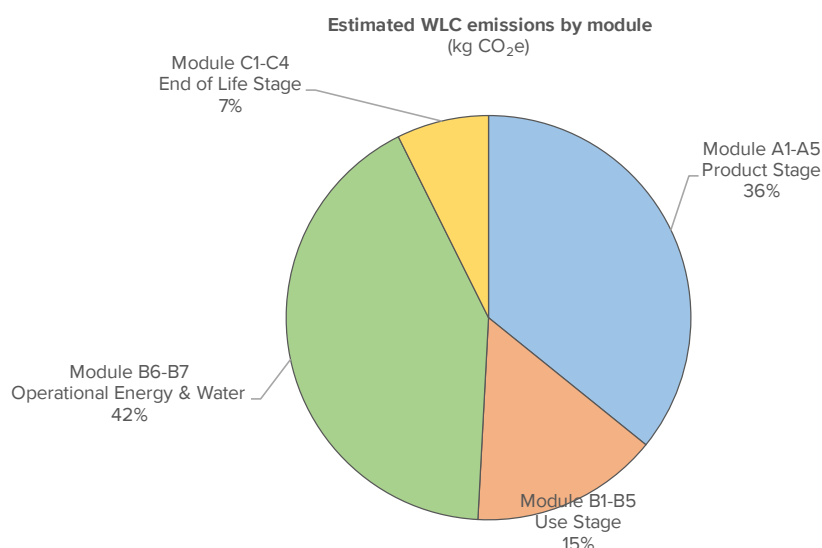


Figure 3: Estimated WLC emissions by module

Figure 4 shows the full results of the Estimated WLC Assessment sub-divided by building element category. This scenario has been chosen to form the basis of design decisions. The results show that the highest contribution to the whole life carbon of the project is the Services (MEP). The second largest contributor is the Superstructure and the third largest is the sub-structure. Within GLA WLC assessments guidance the breakdown of a typical apartment/hotel development for modules A1-A5, excluding sequestration and B-C (excluding B6 & B7) is shown in Table 5.

Some options were implemented in order to reduce the building's whole life carbon emissions. These include:

- The use of 50% GGBS cement replacement in Substructure and Foundations, 30% GGBS cement replacement in Frame and Superstructure

Table 5: Breakdown of a typical apartment/hotel development for modules A1-A5, excluding sequestration and B-C (excluding B6 & B7).

	Breakdown of a typical development: apartment/ hotel		Breakdown of Jessica Button Factory (%)	
	A1-A5 (excluding sequestration)	B-C (excluding B6 & B7)	A1-A5 (excluding sequestration)	B-C (excluding B6 & B7)
Substructure	21%	1%	24%	<1%
Superstructure	61%	25%	65%	50%
Internal Finishes	10%	27%	5%	29%
Finishes, Furniture & Equipment	1%	9%	<1%	6%
Services / MEP	16%	35%	5%	14%
External works	1%	3%	1%	<1%

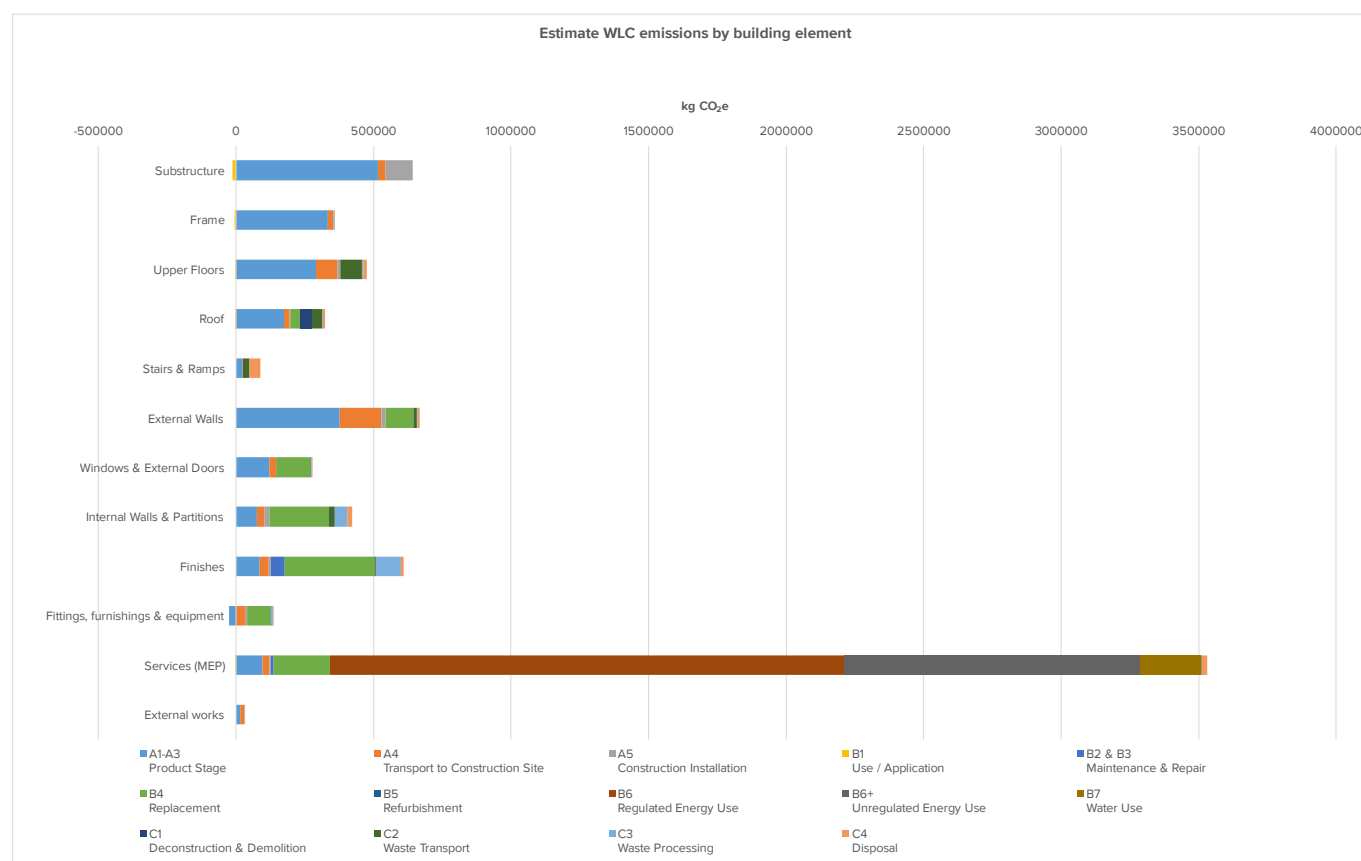


Figure 4: WLC results.

BENCHMARKING

In accordance with the GLA WLC assessments guidance, the estimated emissions have been compared against the benchmark provided by the GLA in the WLC assessments guidance, Appendix 2. The results of Modules A1-A5 and B & C, have been compared against the WLC benchmark for apartment/hotels, and the Aspirational WLC benchmark which is based on the World Green Building Council's target to achieve a 40% reduction in WLC emissions by 2030.

The results in Table 6 show the WLC Benchmark figures for an apartment/hotel building, and estimated carbon emissions of the proposed development for the Estimate WLC emissions Assessment. The anticipated whole carbon emissions of the proposed development for modules A1-A5 are below the WLC benchmark which reflects the positive impacts of the reduction measures adopted in the scheme. This has been achieved by implementing various whole life carbon reduction measures, including:

- The use of 50% GGBS cement replacement in Substructure and Foundations, 30% GGBS cement replacement in Frame and Superstructure

The anticipated whole carbon emissions of the proposed development for modules B1-B5 and C are however slightly above the GLA benchmark, at the current design stage there is a high level of uncertainty with the finishes section and the mechanical services specifications in terms of specified materials as well as maintenance, repair, and replacement and disposal considerations, which is believed to have caused this discrepancy.

The following WLC reduction opportunities will be investigated at the next stage, with a view to achieving further reductions in whole life carbon:

- Hybrid Timber-Aluminium Windows
- Calcium Sulphate Screeds

The results show the estimated emissions calculated based on the information available to date and provided by the design team. These will be reviewed at the next stage when specifications are detailed.

Table 6: WLC Benchmark for apartment/hotel developments

Modules	WLC benchmark	Aspirational WLC benchmark	30-36 Clarendon Road Assessment
	Kg CO ₂ e per m ² (GIA)		
A1-A5 (excluding sequestration)	<850	<500	633
B-C (excluding B6 & B7)	<350	<300	395

APPENDIX 1: ESTIMATE WLC EMISSIONS ASSESSMENT RESULTS IN FULL

Building element		KG's of carbon dioxide equivalent															
		Biogenic carbon	A1-A3 Product Stage	A4 Transport to Site	A5 Construct. works	B1 Use	B2 & B3 Mainten. & Repair	B4 Replace	B5 Refurbish	B6 Regulated Energy Use	B6+ Unreg. Energy Use	B7 Water Use	C1 Deconst. & Demo.	C2 Waste Transport	C3 Waste Process	C4 Disposal	D Benefits & loads beyond system boundary
0.1	Demolition: Toxic / Hazardous / Contaminated Material Treatment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.2	Major Demolition Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.3	Temporary Support to Adjacent Structures	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.4	Specialist Ground Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	Temporary Diversion Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Substructure	-5841	514980	29060	99499	-11427	0	0	0	0	0	0	0	0	0	0	-27051
2.1	Frame	-13569	333961	19511	5097	-4966	0	0	0	0	0	0	0	0	0	0	-12026
2.2	Upper Floors	-63450	289925	78524	9759	-3	0	0	0	0	0	0	0	79460	4893	13346	-12580
2.3	Roof	-13732	173230	21092	2794	-1508	0	35926	0	0	0	0	42818	36900	2754	8577	-1172
2.4	Stairs & Ramps	140	22703	1036	277	0	0	0	0	0	0	0	0	25261	2	38365	-770
2.5	External Walls	-40400	377886	149567	15629	0	0	100801	0	0	0	0	0	14914	852	7912	221934
2.6	Windows & External Doors	1015	121425	24933	31	0	0	125447	0	0	0	0	0	2440	184	41	-5326
2.7	Internal Walls & Partitions	-7539	74586	29855	15809	0	0	215196	0	0	0	0	0	23938	45510	17948	530451
2.8	Internal Doors	-6605	-442	1078	1056	0	0	0	0	0	0	0	0	1895	0	252	-940
3	Finishes	-22333	86709	31735	7008	0	50615	327088	0	0	0	0	0	4341	92241	8963	-1423
4	Fittings, furnishings & equipment	-64684	-25083	34355	6903	0	0	84972	0	0	0	0	0	453	6831	5	-12173
5	Services (MEP)	-168	95451	26881	3627	-4	9328	206014	0	1869985	1077821	218401	0	2759	0	20145	-36201

6	Prefabricated Buildings & Building Units	0	0	0	0	0	0	0	0	0	0	0	0	0	1380	0	31338	0
7	Work to Existing Building	0	0	0	0	0	0	0	0	0	0	0	0	0	8944	0	11237	0
8	External works	142	14541	16396	1428	0	0	0	0	0	0	0	0	0	0	0	0	0