AFFORABLE RESIDENTIAL (BLOCK 1), BATTERSEA PARK ROAD

LONDON BOROUGH OF WANDSWORTH,
GREATER LONDON AUTHORITY,

WHOLE LIFE-CYCLE CARBON ASSESSMENT AND REPORTING

Detailed Planning Application – Report

FOR

WATKIN JONES GROUP

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Version Control

Issue	Document Name	Revision No.	Date of Issue	Description	Reviewed By
1	Affordable Residential (Block 1), Battersea Park Road - Whole Life Carbon Assessment and Reporting	v1.01	29th March 2023	GLA Detailed Planning Application, Whole Life-Cycle Carbon Assessment and Reporting	Watkin Jones Group

Content

Executive Summary

This Whole Life-Cycle Carbon Assessment forms part of requirements set under London Plan Policy SI 2 Minimising GHG Emissions (Point F).

This Whole Life-Cycle Carbon Assessment is submitted on behalf of Watkin Jones Group ('The Applicant') to accompany an application for full planning permission for the redevelopment of the site at 41-49 (Bookers) and 49-59 (BMW) Battersea Park Road ("the Site"). The scheme has a total area of 34,545 m2 GIA.

The Results presented in this Report is for **Block 1 Affordable Residential**, which has a total area of 6,152 m2 GIA.

This WLC Assessment should be read in conjunction with the Circular Economy Statement and Energy Statement/Strategy.

The scheme's embodied carbon is within the GLA Current Benchmark for (i) Module A1-A5 material upfront embodied carbon (ii) Module B-C (excl. B6/B7) material in-use and end of life, and (iii) Whole Life Module A, B, C (excl. B6/B7).

The scheme's embodied carbon exceeds the GLA Aspirational Benchmark for (i) Module A1-A5 material upfront embodied carbon and (ii) Whole Life Module A, B, C (excl. B6/B7).

The scheme will explore opportunities to further reduces its embodied carbon. High GWP building elements have already been identified within this report. The scheme will explore design opportunities such as the following to reduce the whole life embodied carbon:

- Reducing the quantity of these materials,
- Specifying an alternate product that can demonstrate low carbon impact (i.e. referring to manufacturer's EPDs)
- Specifying an alternate product/ system that has a lower carbon impact.

1 Project Summary

This Whole Life-Cycle Carbon Assessment is submitted on behalf of Watkin Jones Group ('The Applicant') to accompany an application for full planning permission for the redevelopment of the site at 41-49 (Bookers) and 49-59 (BMW) Battersea Park Road ("the Site"). The scheme has a total area of 34,545 m2 GIA.

The Results presented in this Report is for Block 1 Affordable Residential, which has a total area of 6,152 m2 GIA.

This Whole Life-Cycle Carbon Assessment forms part of requirements set under London Plan Policy SI 2 Minimising GHG Emissions (Point F).

This section gives details on the scheme based on information provided by the client and project team.

1.1 Brief:

Demolition of existing building and construction of three new buildings, together comprising Residential (Use Class C3) and Student Accommodation (Sui Generis) along with Commercial, Business and Service (Use Class E) and/or Local Community and Learning (Class F) floorspace. Associated works include hard and soft landscaping, car parking and new vehicular access / servicing, and other ancillary works. This GLA WLCA analysis is with respect to Affordable Residential (Block 1).

The Results presented in this Report is for Block 1 Affordable Residential, which has a total area of 6,152 m2 GIA.

1.2 Details

Project Name	Battersea Park Road
Functions	Affordable Residential
Total Area	6,152 m2 GIA
Location / Address	41-49 (Bookers) and 49-59 (BMW) Battersea Park Road
Construction project type	New build
Current project stage (RIBA)	Stage 2

2 Whole Life-Cycle Carbon Assessment Approach

This section gives details on the whole life-cycle carbon methodology that has been followed for this assessment, along with all assumptions considered to complete the study.

The assessment for the scheme is based on information provided by the client and the project team.

The methodology and assumptions for the whole life-cycle carbon assessments reflect the scope, design and material choices proposed for the scheme's detailed GLA planning application.

This WLC Assessment should be read in conjunction with the Circular Economy Statement and Energy Statement/Strategy.

2.1 WLCA Assessment Purpose(s)

The purpose(s) for carrying out the whole life carbon assessment are as follows:

Assessment purpose	GLA Whole Life Carbon Reporting and Benchmarking
Body/organisation setting the requirements	Requirement Set Out by London Plan Guidance for Whole Life Cycle Carbon Assessment (March 2022). This WLCA Guidance forms part of London Plan Policy SI 2 Minimising GHG Emissions (Point F)
Key standard(s) or methodology(ies) reference(s)	(i)Whole Life-Cycle Carbon Assessments – London Plan Guidance, March 2022 (ii)BS EN 15978, Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method (iii)RICS Whole life carbon assessment for the built environment 1st edition, November 2017)

2.2 WLCA Assessment Details

Assessor's name	**Harish Borah**
Assessor organisation name	ADW Developments Ltd.
Date assessment completed	28/3/2023
Building LCA software and version used	eToolLCD (*this tool is accepted by GLA/RICS)
Building LCA tool data version used	eToolLCD Dataset available under dataset - 'United Kingdom LCI – V17 – Life Cycle Strategies'

Additional LCA data and manufacturer specific EPD used	Appendix 1 indicates any additional LCA data used. Where available for proprietary specified product(s), Environmental Product Declarations (developed using 'EN 15804 standard') are have been used. See Appendix 1

2.3 WLCA Assessment - Study Period

According to the requirements of the assessment purpose(s), the study period for this assessment is 60 years.

2.4 WLCA Assessment Scope – Study Impact Categories

The following impact categories have been included in the assessment. This scope is aligned with the assessment purpose(s).

Table 1 Assessment scope – impact categories

Impact category	Indicator	Unit
Climate Change - total	Global Warming Potential total (GWP-total)	kgCO2eq.
Climate Change - biogenic	Global Warming Potential biogenic (GWP-biogenic) Note: For modules A1-A3 only.	kgCO2eq.

2.5 WLCA Assessment Scope – Study Life Cycle Modules

The following life cycle modules have been included in the assessment. This scope is aligned with the assessment purpose(s).

Table 2 Assessment scope – life cycle modules

EN 15978 : Life Cycle Module Code	Life Cycle Module Name	Assessment
	Pre-construction demolition (not an EN 15978 module)	The options to retain the existing buildings/structures (3,018 m2 retail unit) have been fully explored. Please see design teams' feasibility assessments and CES for further information.
A1-A3	Product stage	Included
A4	Transport	Included
A5	Construction installation process	Included

EN 15978 : Life Cycle Module Code	**Life Cycle Module Name**	**Assessment**
B1	Use	Included
B2	Maintenance	Included
B3	Repair	Included
B4	Replacement	Included
B5	Refurbishment	Excluded *– No Pre-Planned Refurbishment Works*
B6	Operational energy use	Included
B7	Operational water use	Included
C1	Deconstruction / demolition	Included
C2	Transport	Included
C3	Waste processing	Included
C4	Disposal	Included
D	Benefits and loads beyond the system boundary	Included

2.7 WLCA Assessment Scope – Building Elements

The following construction elements have been included in the assessment. This scope is aligned with the assessment purpose(s).

The scope includes newly installed and retained existing products/materials, including temporary works.

The percentage of each element category by capital cost included in the assessment is shown below – at least 95% per element category. Any excluded items each account for less than 1% of the total capital cost of that building element category.

An adjustment factor has not been applied for remaining items not covered in the assessment scope.

Table 3 Assessment scope – elements

Element category (RICS NRM)		**LCA Analysis**
Demolition	0.1 Toxic/hazardous/ contaminated material treatment	
	0.2 Major demolition works	
Facilitating works	0.3 and 0.5 Temporary/enabling works	
	0.4 Specialist groundworks	
1 Substructure	1.1 Substructure	Included
2 Superstructure	2.1 Frame	Included
	2.2 Upper floors incl. balconies	Included
	2.3 Roof	Included
	2.4 Stairs and ramps	Included
	2.5 External walls	Included
	2.6 Windows and external doors	Included
	2.7 Internal walls and partitions	Included
	2.8 Internal doors	Included
3 Finishes	3.1 Wall finishes	Included
	3.2 Floor finishes	Included
	3.3 Ceiling finishes	Included
4 Fittings, furnishings and equipment (FFE)	4.1 FFE including building-related* and non-building-related**	Included
5 Building services/MEP	5.1–5.14 Services including building-related* and non-building-related**	Included

6 Prefabricated buildings and building units	6.1 Prefabricated buildings and building units	Included (scheme has no item)
7 Work to existing building	7. Minor demolition and alteration works	Included (scheme has no item)
8 External works	8.1 Site preparation works	Included
	8.2 Roads, paths, pavings and surfacings	Included
	8.3 Soft landscaping, planting and irrigation systems	Included
	8.4 Fencing, railings and walls	Included
	8.5 External fixtures	Included
	8.6 External drainage	Included
	8.7 External services	Included
	8.8 Minor building works and ancillary buildings	Included

** Building-related items: building-integrated technical systems and furniture, fittings and fixtures built into the fabric or included in the shell and core specification. Building-related MEP and FFE typically include the items classified under Shell and Core and Category A fit-out.*

*** Non-building-related items: loose furniture, fittings and other technical equipment like desks, chairs, computers, refrigerators, etc. Such items are usually part of Category B fit-out. Therefore, for Shell and Core construction this is not part of the assessment scope.*

2.8 Assumptions and Limitations

The assessment is based on the following assumptions and limitations. Additional assumptions and limitations per item, including proxies, may be given or implied in Appendix 1. The listed assumptions and limitations are either in addition to or override the building LCA tool default assumptions and limitations.

Reference Document

BOQ - Whole Life Carbon .xlsx
956-TSY-ZZ_XX-RP-S-4000_STRUCTURAL EMBODIED CARBON REPORT 001.pdf
6892 Battersea Park Road Energy Statement 2023.03.17 RevDRAFT.pdf

1. Product Stage

A1-A3 - Biogenic carbon reporting

It is assumed timber based products are sustainably sourced; specified to have FSC and PEFC certification.

Based on values reported by the building LCA tool for the 'Climate change – biogenic', Global Warming Potential biogenic (GWP-biogenic) kgCO2eq. indicator.

Where negative only module A1-A3 values are reported, this is simply based on deleting positive A1-A3 Global Warming Potential biogenic (GWP-biogenic) values where they occur for reporting categories.

A1-A3 - Product stage

See design data sources above. Generic LCA data was used. Where available for proprietary specified product(s), EN 15804 compliant EPD are have been used.

Appendix 1, including material/product proxies and quantity estimates.

Major Items

- Concrete (Substructure) – 20% Cement Replacement with GGBS
- Concrete (Superstructure) - 20% Cement Replacement with GGBS
- Rebar (Substructure, Frame, Upper Floor) - 95% Recycled Content

2. Construction Stage

A4 – Transport

eToolLCD Default

A5 - Construction installation process

RICS PS default: 1400kgCO2e/£100k of project value
(default A5 impacts estimated by the LCA tool has not been considered, to avoid double counting)

3. Use Stage

B1 – Use

Includes Refrigerant Emission. The refrigerant type, initial charge, % annual leakage and % end of life recovery has been based on Email Dated 23rd March 2023 received from the project team.

B2 - Maintenance

GLA WLC default: 10 kgCO2e/m2 gross internal area (GIA) is used to cover all building element categories, or 1% of modules A1-A5, whichever is greater.

B3 – Repair

RICS PS/GLA WLC default: 25% of module B2.

B4 – Replacement

The building LCA software tool default service lives or a reasonable estimate have been used.
Assumed 100% replacement at each replacement interval.

B5 – Refurbishment

Excluded as no pre-planned refurbishment considered.

B6 - Operational energy use

Based on SAP 10.2 methodology (using SAP 10.0 carbon factors applying the GLA Carbon Emission Reporting Spreadsheet V2.0).

Decarbonisation of energy sources will not apply.

B7 - Operational water use

Based on emission factors published in 'UK Government GHG Conversion Factors for Company Reporting'

4. End Of Life Stage

C1 - Deconstruction / demolition

RICS PS default: 3.4 kgCO2e/m2 GIA

C2 – Transport

LCA software tool defaults.

C3 - Waste processing

End-of-life scenarios aligned with GLA CES Statement within the limitations of the building LCA software tool.

C4 - Disposal

End-of-life scenarios aligned with GLA CES Statement within the limitations of the building LCA software tool.

5. D - Benefits and loads beyond the system boundary

Building LCA software tool default assumptions.
Reuse and recycling scenarios aligned with GLA CES Statement within the limitations of the building LCA software tool.

3 Results

3.1 Whole Life GWP Overview (Module Breakdown)

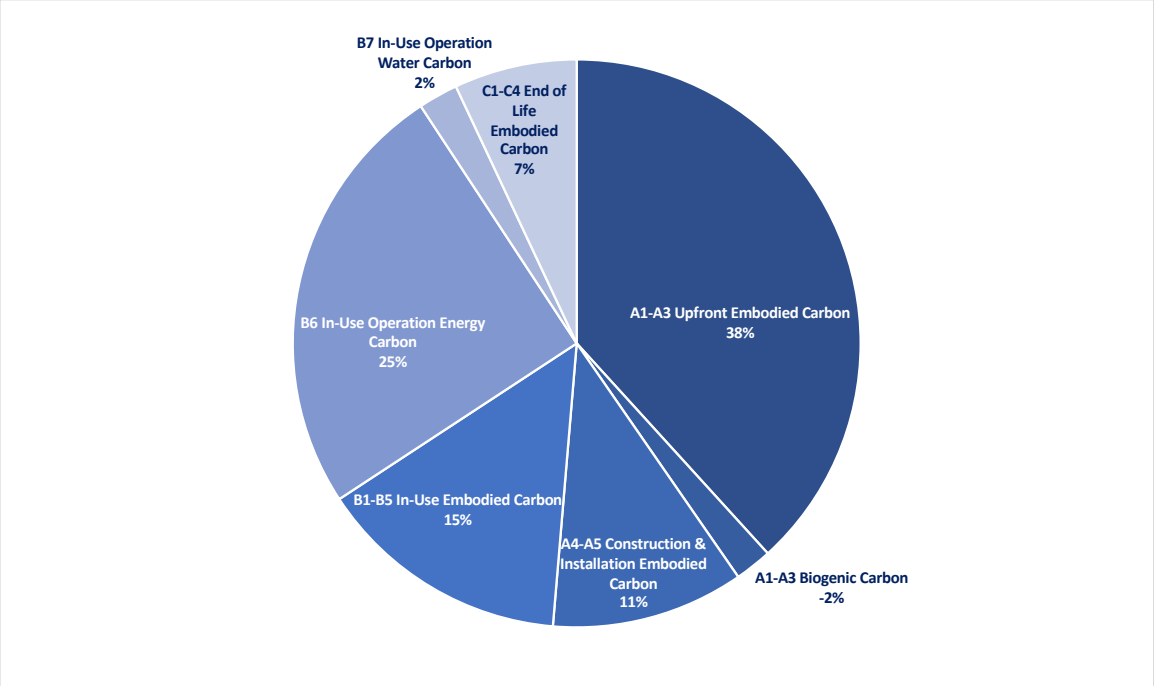
The 60-year WLCA analysis, found the Total Global Warming Potential (kg CO2eq) of the development, excluding operational energy and water to be **8,164,256.**

List of Building items and their respective quantities that constitute the WLCA analysis has been listed out in Appendix 1.

The breakdown of the 60-year WLCA analysis, is as follows:

Sr.	Building Element Category	GWP	GWP/m2	% breakdown
1	Upfront Embodied Carbon (A1-A5)	3,260,882	530.05	**38%**
	Biogenic Carbon (A1-A3)	(180,660)	(29.37)	
2	Construction & Installation Embodied Carbon (A4-A5)	935,448	152.06	**11%**
3	In-Use Embodied Carbon (B1-B5)	1,229,565	199.86	**15%**
4	In-Use Operation Energy Carbon (B6)	2,130,000	346.23	**26%**
5	In-Use Operation Water Carbon (B7)	192,650	31.31	**2%**
6	End of Life Embodied Carbon (C1-C4)	596,370	96.94	**7%**
	Total	**8,164,256**	**1,327.09**	**100%**
7	*Module D*	(1,01,529)	(16.50)	

Graph: 60 Year GWP Breakdown



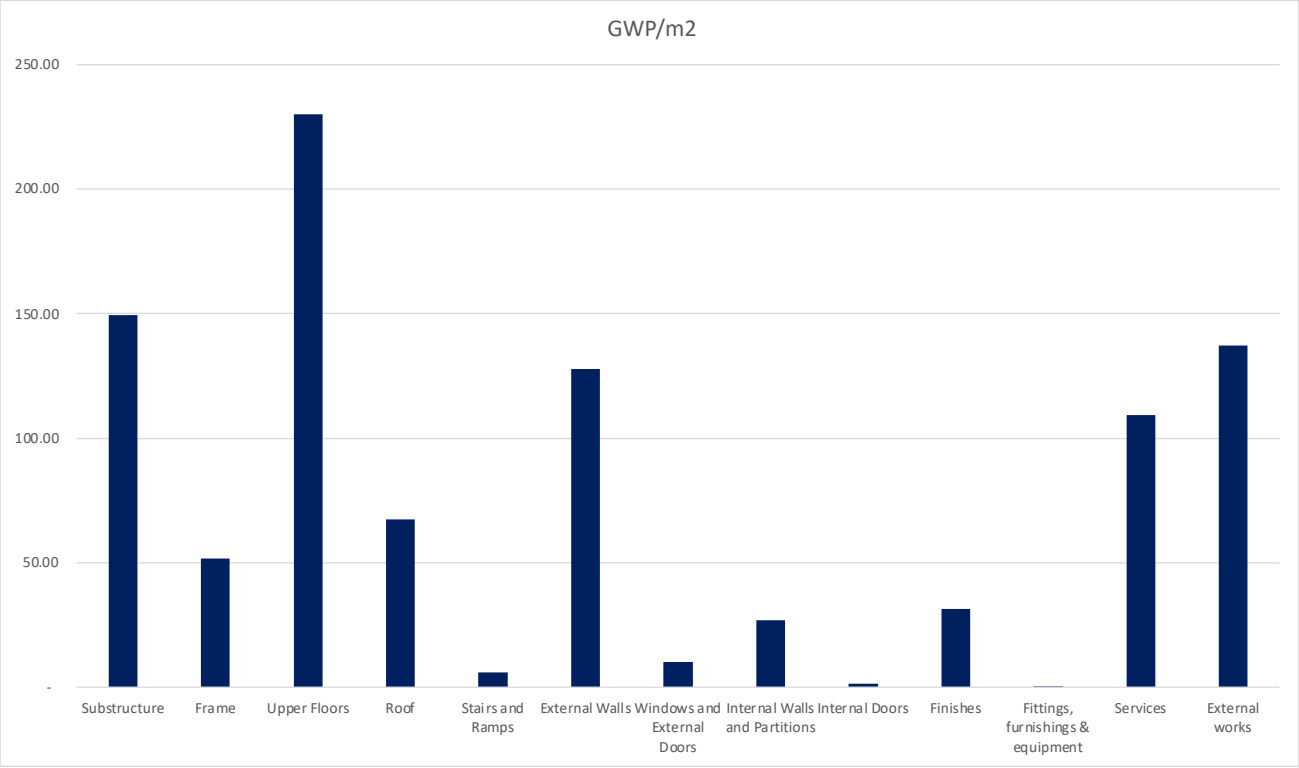
3.2 Whole Life Embodied GWP Overview (Element Breakdown)

The 60-year material embodied carbon for the scheme is estimated to be **5,841,606** kg CO2eq (modules - A1-A5, B1-B5, C1-C4) at a rate of **950** kg CO2eq/m2.

NRM	Building Element Category	GWP	GWP/m2	% breakdown
1	Substructure	918,247	149.26	15.72%
2.1	Frame	318,145	51.71	5.45%
2.2	Upper Floors	1,416,108	230.19	24.24%
2.3	Roof	414,366	67.35	7.09%
2.4	Stairs and Ramps	37,815	6.15	0.65%
2.5	External Walls	786,684	127.87	13.47%
2.6	Windows and External Doors	63,015	10.24	1.08%
2.7	Internal Walls and Partitions	166,468	27.06	2.85%
2.8	Internal Doors	8,639	1.40	0.15%
3	Finishes	194,417	31.60	3.33%
4	Fittings, furnishings & equipment	100	0.02	0.00%
5	Services	672,800	109.36	11.52%
8	External works	844,801	137.32	14.46%
	Total	**5,841,606**	**950**	**100%**

Refer Appendix 3 for Detailed Breakdown

Graph: 60 Year GWP



3.3 A1-A5 Embodied GWP Overview

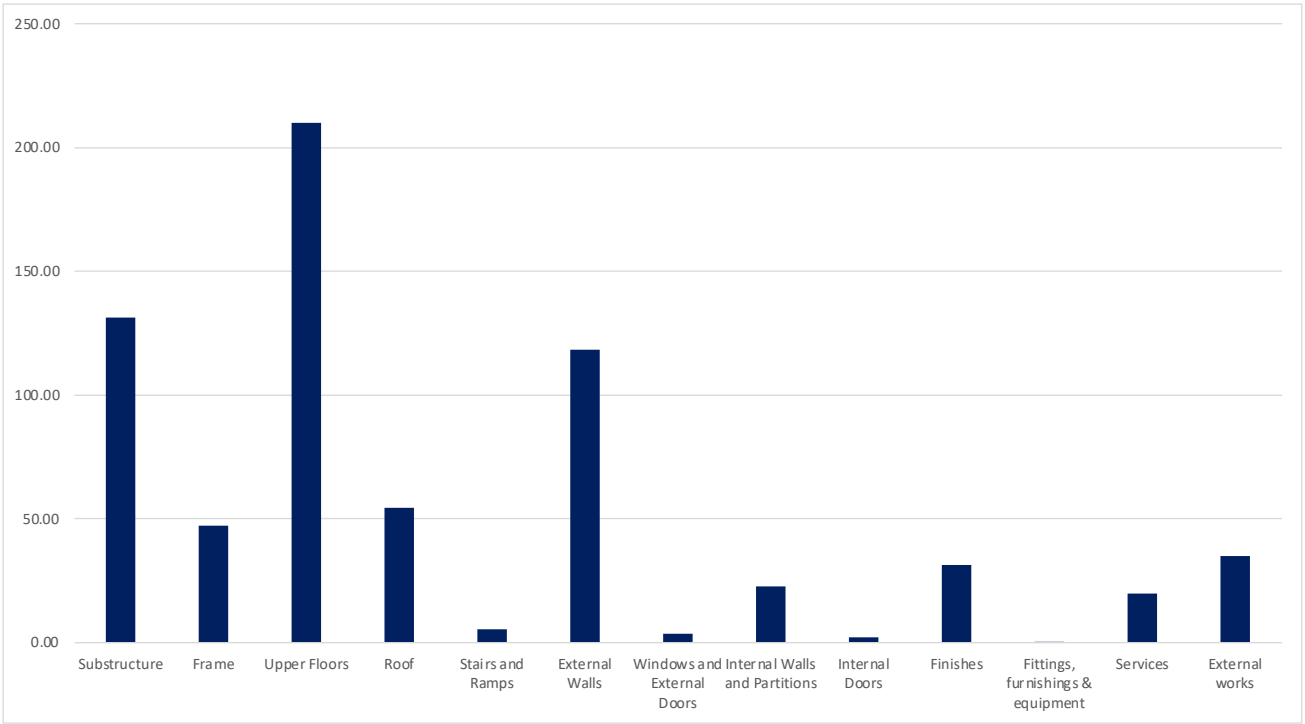
The Module A1-A5 material upfront embodied carbon for the scheme is estimated to be **4,196,330** kg CO2eq at a rate of **682.11** kg CO2eq/m2.

(Modules A1-A3 represent product stage, Modules A4 represent transportation to site and Modules A5 represent construction)

NRM	Building Element Category	GWP	GWP/m2	% breakdown
1	Substructure	807,788	131.30	19.25%
2.1	Frame	290,611	47.24	6.93%
2.2	Upper Floors	1,293,142	210.20	30.82%
2.3	Roof	335,298	54.50	7.99%
2.4	Stairs and Ramps	33,158	5.39	0.79%
2.5	External Walls	728,358	118.39	17.36%
2.6	Windows and External Doors	22,840	3.71	0.54%
2.7	Internal Walls and Partitions	139,588	22.69	3.33%
2.8	Internal Doors	13,296	2.16	0.32%
3	Finishes	194,035	31.54	4.62%
4	Fittings, furnishings & equipment	47	0.01	0.00%
5	Services	122,928	19.98	2.93%
8	External works	215,239	34.99	5.13%
	Total	**4,196,330**	**682.11**	**100%**

Refer Appendix 3 for Detailed Breakdown

Graph: A1-A5 Element GWP



3.4 A1-A5 Embodied GWP Hotspots (for Further Reduction):

To assist the project team in prioritising and decision making for future stages to reduce Module A1-A5 Carbon, it is noted that the following items have the highest Module A1-A5 GWP upfront embodied carbon (highest to lowest):

NRM	Building Element Category	A1-A5 GWP	% of Total A1-A5
2.2	2.2.1 Floors Flat Slab (Concrete)	793,018	18.90%
2.2	2.2.1 Floors Flat Slab (Rebar)	468,260	11.16%
1	1.1.1 Foundations Piling & Foundation (Concrete)	393,530	9.38%
2.5	2.5.1 External Walls - Facing Brickwork	362,090	8.63%
2.5	2.5.1 External Walls - Concrete Walls (Concrete)	179,001	4.27%
3	3.2.1 Finishes to floors - Screed	156,229	3.72%
2.1	2.1.4 Concrete Frame (Rebar)	135,263	3.22%
2.1	2.1.4 Concrete frames (Concrete)	134,309	3.20%
2.7	2.7.1 Walls and partitions Blockwork Walls	125,984	3.00%
1	1.1.1 Foundations Piling & Foundation (Rebar)	96,911	2.31%

Refer Appendix 3 for Detailed Breakdown

The Module A1-A5 GWP of these items can be reduced by,

- Reducing the quantity of these materials,
- Specifying an alternate product that can demonstrate low carbon impact (i.e. referring to manufacturer's EPDs)
- Specifying an alternate product/ system that has a lower carbon impact

The WLCA considers the scheme as applying 20% Blended Cement in Concrete (as against 0% GGBS) which has offered a WLC GWP reduction of 14 kgCO2/m2GIFA, overall.

Further opportunities studied include:

- Use of 30% GGBS blended cement in substructure and superstructure concrete

This has the potential of further reducing the WLC GWP (approx. by 7 kgCO2/m2GIFA) **of the scheme.**

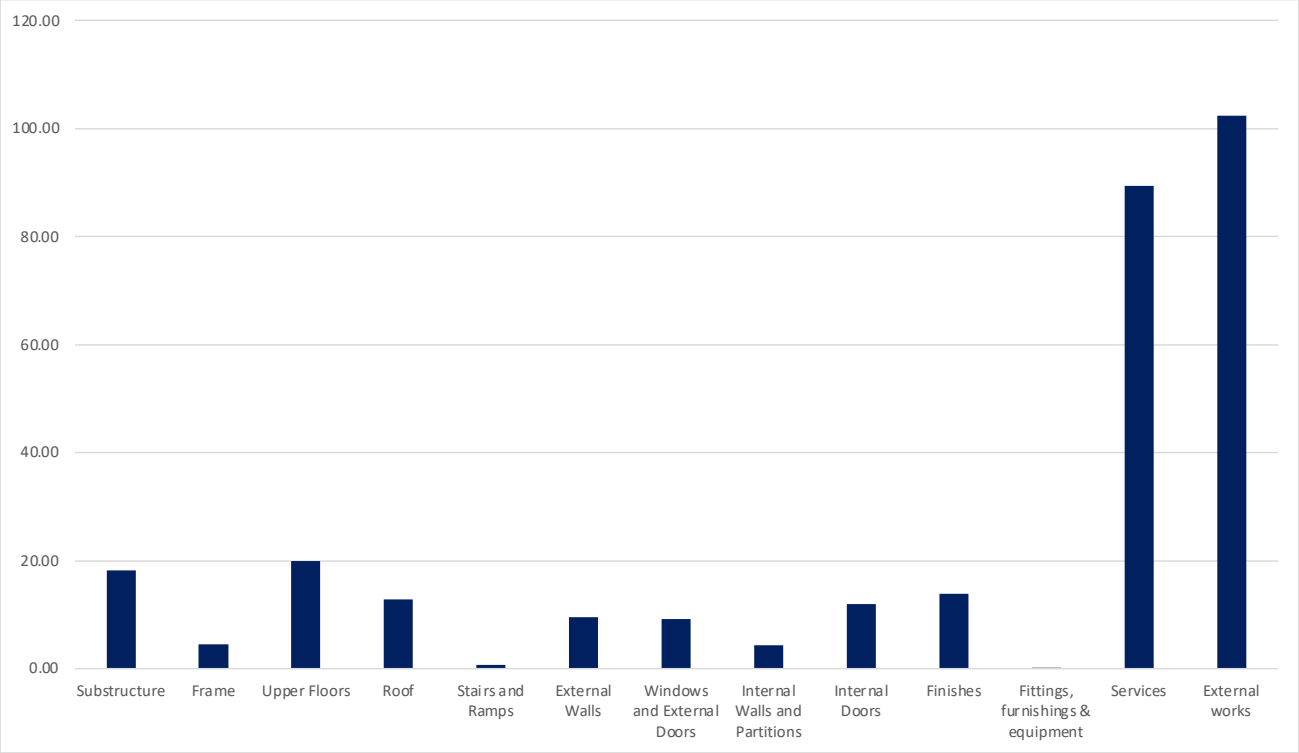
3.5 B-C (except B6/7) Embodied GWP Overview

The Module B-C (excl. B6/B7) material in-use and end of life for the scheme is estimated to be **1,825,935** kg CO2eq at a rate of **296.80** kg CO2eq/m2.

NRM	Building Element Category	GWP	% breakdown	GWP/m2
1	Substructure	111,503	18.12	6.11%
2.1	Frame	27,533	4.48	1.51%
2.2	Upper Floors	122,966	19.99	6.73%
2.3	Roof	79,068	12.85	4.33%
2.4	Stairs and Ramps	4,657	0.76	0.26%
2.5	External Walls	58,326	9.48	3.19%
2.6	Windows and External Doors	56,208	9.14	3.08%
2.7	Internal Walls and Partitions	26,879	4.37	1.47%
2.8	Internal Doors	73,749	11.99	4.04%
3	Finishes	85,559	13.91	4.69%
4	Fittings, furnishings & equipment	53	0.01	0.00%
5	Services	549,872	89.38	30.11%
8	External works	629,562	102.33	34.48%
	Total	**1,825,935**	**296.80**	**100%**

Refer Appendix 3 for Detailed Breakdown

Graph: B-C Element GWP



3.6 B-C (except B6/7) Embodied GWP Hotspots (for Further Reduction):

To assist the project team in prioritising and decision making for future stages to reduce B-C Carbon, it is noted that the following items have the highest GWP in Modules B-C (except B6, B7) (highest to lowest):

NRM	Building Element Category	B-C GWP	% of Total B-C
5	5.13.4 HVAC Heat Pump	369,169	20.22%
8	8.2.1 Paths & Pavings Aggregate Filling	219,218	12.01%
8	8.1.1 Site clearance Material Fill	193,292	10.59%
5	5.13.4 PV Array	100,833	5.52%
2.2	2.2.1 Floors Flat Slab (Concrete)	100,381	5.50%
2.8	2.8.1 Internal Doors	73,749	4.04%
8	8.2.1 Paths and Pavings Sand Blinding	62,772	3.44%
2.3	2.3.1 Roof structure Projecting Canopy	51,687	2.83%
1	1.1.1 Foundations Piling & Foundation (Concrete)	49,813	2.73%
3	3.2.1 Finishes to floors Wood Flooring	48,876	2.68%

Refer Appendix 3 for Detailed Breakdown

Further, consideration can be applied to items with particularly low durability (service life), that undergo replacement at high frequency.

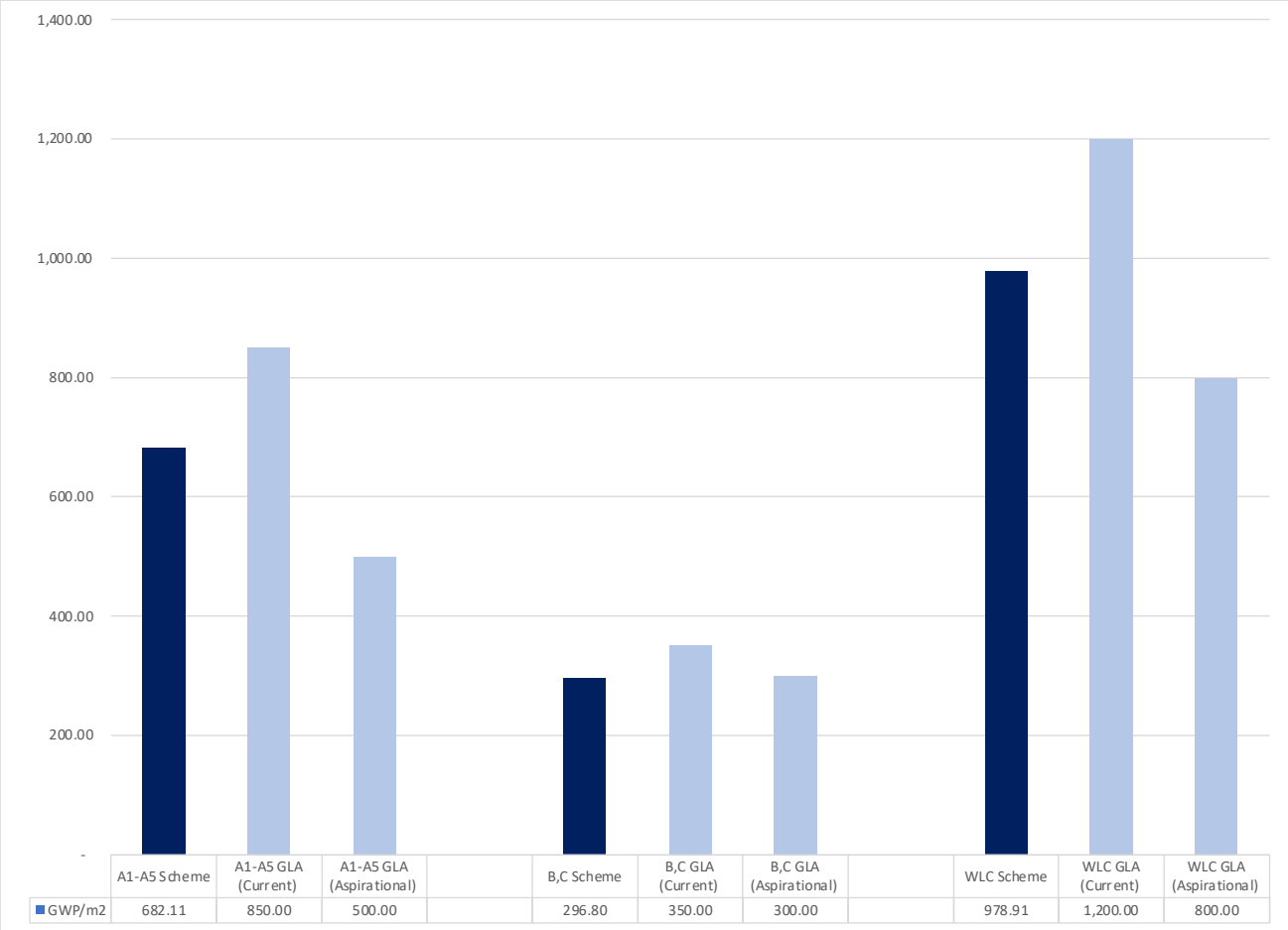
The Module B-C GWP of these items can be reduced by,

- Reducing the quantity of these materials,
- Specifying an alternate product that can demonstrate low carbon impact (i.e. referring to manufacturer's EPDs)
- Specifying an alternate product/ system that has a lower carbon impact

3.7 GWP Benchmark: Scheme vs GLA

The Scheme's is within the GLA Current Benchmark for (i) Module A1-A5 material upfront embodied carbon (ii) Module B-C (excl. B6/B7) material in-use and end of life, and (iii) Whole Life Module A, B, C (excl. B6/B7).

The scheme exceeds the GLA Aspirational Benchmark for (i) Module A1-A5 material upfront embodied carbon and (ii) Whole Life Module A, B, C (excl. B6/B7).



Note:

- ***Module A1-A5 GLA Benchmark*** *does not include biogenic carbon impact*
- ***Module B-C GLA Benchmark*** *does not include impact of Modules B6 and B7*
- ***Whole Life GLA Benchmark*** *include impact of biogenic carbon and excludes Module D impact*

Module A1-A5

The Module A1-A5 material upfront embodied carbon for the scheme is estimated to be **4,196,330** kg CO2eq at a rate of **682.11** kg CO2eq/m2.

The scheme is,

- within the Current Benchmark of 850 kg CO2e/m2 GIA
- exceed the Aspirational Benchmark of 500 kg CO2e/m2 GIA by 36% (approx.)

Module B-C (excl. B6-B7)

The Module B-C (excl. B6/B7) material in-use and end of life for the scheme is estimated to be **1,825,935** kg CO2eq at a rate of **296.80** kg CO2eq/m2.

The scheme is

- within the Current Benchmark of 350 kg CO2e/m2 GIA
- within the Aspirational Benchmark of 300 kg CO2e/m2 GIA

Module B4 (Replacement) account for 53% of the total Module B-C value. **External Works and Services** make up the largest B4 (Replacement) carbon item.

Whole Life

The 60-year material embodied carbon for the scheme is estimated to be **5,841,606** kg CO2eq (modules - A1-A5, B1-B5, C1-C4) at a rate of **950** kg CO2eq/m2.

The scheme is,

- within the Current Benchmark of 1200 kg CO2e/m2 GIA
- exceed the Aspirational Benchmark of 800 kg CO2e/m2 GIA by 19% (approx.)

4 Conclusion & Recommendation

1. The 60-year WLCA analysis, found the Total Global Warming Potential (kg CO2eq) of the development, excluding operational energy and water to be **8,164,256.**

2. The 60-year material embodied carbon for the scheme is estimated to be 5,841,606 kg CO2eq (modules - A1-A5, B1-B5, C1-C4) at a rate of **950 kg CO2eq/m2 GIA.**

   *The scheme is within the WLC (Current) Benchmark of **1200 kg CO2e/m2 GIA,** but approx. 19% higher than the WLC (Aspirational) benchmark.*

3. The Module A1-A5 material upfront embodied carbon for the scheme is estimated to be **4,196,330** kg CO2eq at a rate of **682.11** kg CO2eq/m2.

   *The scheme is within the A1-A5 (Current) Benchmark of **850 kg CO2e/m2 GIA,** but approx. 36% higher than the A1-A5 (Aspirational) benchmark.*

4. The Module B-C (excl. B6/B7) material in-use and end of life for the scheme is estimated to be **1,825,935** kg CO2eq at a rate of **296.80** kg CO2eq/m2.

   Module B4 (Replacement) account for **53%** of the total Module B-C value. **External Works and Services** make up the largest B4 (Replacement) carbon item.

5. In conclusion, the scheme's is within the GLA Current Benchmark for (i) Module A1-A5 material upfront embodied carbon (ii) Module B-C (excl. B6/B7) material in-use and end of life, and (iii) Whole Life Module A, B, C (excl. B6/B7).

   The scheme exceeds the GLA Aspirational Benchmark for (i) Module A1-A5 material upfront embodied carbon and (ii) Whole Life Module A, B, C (excl. B6/B7).

   The scheme will explore opportunities to further reduces its embodied carbon. High GWP building elements have already been identified within this report. The scheme will explore design opportunities such as the following to reduce the whole life embodied carbon:

   - Reducing the quantity of these materials,
   - Specifying an alternate product that can demonstrate low carbon impact (i.e. referring to manufacturer's EPDs)
   - Specifying an alternate product/ system that has a lower carbon impact.

5 Acknowledgements

In preparing this report we acknowledge use of the following sources:

- London Plan Policy i.e. Part F of SI2
- Mayor of London WLC_Guidance_March_2022.pdf
- RICS Whole life carbon assessment for the built environment (1st edition, November 2017)

6a Appendix 1 – LCA Model (Quantity)

(attached, next page)

6b Appendix 2 – LCA Model (Materials)

(attached, next page)

6c Appendix 3 – LCA Model (Results Breakdown)

(attached, next page)

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
1.1.1	Standard foundations	0.2.1 Demolition works Demolition			Assumed Considered Under RICS PS A5 Assumption	
1.1.1	Standard foundations	1.1.1 Standard foundations Cartaway			Assumed Considered Under RICS PS A5 Assumption	
1.1.1	Standard foundations	1.1.1 Standard foundations Excavation			Assumed Considered Under RICS PS A5 Assumption	
1.1.1	Standard foundations	1.1.1 Standard foundations Level & Compaction			Assumed Considered Under RICS PS A5 Assumption	
1.1.1	Standard foundations	1.1.1 Standard foundations Piling Foundation			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.1	Standard foundations	1.1.1 Standard foundations Piling Mat			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.1	Standard foundations	1.1.1 Standard foundations Piling & Foundation (Concrete)	660.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
1.1.1	Standard foundations	1.1.1 Standard foundations Piling & Foundation (Reinforcement)	40,925.00	kg	Reinforcement Bar - Foundations, 12mm	
1.1.1	Standard foundations	1.1.1 Standard foundations Terram Layer	622.00	m2	Roof covering - gravel ballast, corflute and geotextile (Remove Ballast)	
1.1.1	Standard foundations	1.1.1 Standard foundations Trenches	55.96	m3	Substructure - Large scale excavation (assembly only)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Aggregate Blinding	186.60	m3	Substructure - Aggregate Infill (150 year life span)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Bed & Surround	135.00	m3	Substructure - Aggregate Infill (150 year life span)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Brickwork/Blockwork	100.00	m2	Wall, 200mm Hollow Concrete Block, Unfinished, m2	Assumed 200mm Thick
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Concrete			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Flat Slab (Concrete)	160.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Flat Slab (Reinforcement)	21,600.00	kg	Reinforcement Bar - Foundations, 12mm	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Concrete Blinding	9.33	m3	Screed - Lowest Floor, 1:4 concrete/sand, unreinforced (m3)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction DPM	622.00	m2	Vapour Barrier/Damp Proof Membrane (DPM) - Foundations, Polyethylene, 0.2mm (m2)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Floor Insulation	622.00	m2	Insulation Blanket - Lowest Floor, Polyester/Rockwool Blend Foil-faced Blanket, 140mm (m2)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Formwork	22.49	m3	Formwork - Foundations (m3)	Assumed 50mm Thickness
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction			Included in Row 21	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Gas Membrane	622.00	m2	Vapour Barrier/Damp Proof Membrane (DPM) - Foundations, Polyethylene, 0.2mm (m2)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Ground Beams			Included in Row 8	Follow Structural Analysis Qty
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Isolation Joint			No Datapoint. Absorbed within 10% scheme-wide allowance.	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Levelling			Assumed Considered Under RICS PS A5 Assumption	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Lift Pits (Concrete)	72.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Lift Pits (Reinforcement)	8,640.00	kg	Reinforcement Bar - Foundations, 12mm	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction RC Concrete Bed			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Reinforcement			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Sand Blinding	31.10	m3	Substructure - Sand Bed, Compacted, 150yrs (m3)	Assumed 50mm Thickness
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Timber Earthwork Support			Assumed Considered Under RICS PS A5 Assumption	
1.1.3	Lowest floor construction	1.1.3 Lowest floor construction Working Space			Assumed Considered Under RICS PS A5 Assumption	
1.1.5	Basement retaining walls	1.1.5 Basement retaining walls Retaining Walls	17.76	m3	Retaining Wall 350mm insitu concrete 1% by mass reo, 1.0% reo by volume	Assumed 3m Height & 350mm Thick
1.1.5	Basement retaining walls	1.1.5 Basement retaining walls			Included in Row 37	
2.1.1	Steel frames	2.1.1 Steel frames Secondary Steelwork	10,000.00	kg	Frame - Structural Steel (kg)	From Client
2.1.4	Concrete frames	2.1.4 Concrete frames Concrete Frame			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
2.1.4	Concrete frames	2.1.4 Concrete frames Concrete Frame (Concrete)	225.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.1.4	Concrete frames	2.1.4 Concrete frames Concrete Frame (Reinforcement)	56,900.00	kg	Reinforcement Bar - Frames/Columns/Beams (kg)	
2.1.4	Concrete frames	2.1.4 Concrete frames Framing Columns			Quantity Based on Tier's Structural Embodied Carbon Report (Dated 2023/01/10)	
2.1.4	Concrete frames	2.1.4 Concrete frames PC Lintols	6.00	lm	External Works - Precast Concrete Barrier Kerbs (lm)	Assumed 600mm Length
2.2.1	Floors	2.2.1 Floors Metal Floors	615.20	m2	Floor Structure - Profiled Metal Deck (Superstructure) (m2)	Assume 10% of Floor Area
2.2.1	Floors	2.2.1 Floors Flat Slab (Concrete)	1,330.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.2.1	Floors	2.2.1 Floors Flat Slab (Reinforcement)	179,550.00	kg	Reinforcement Bar - Upper Floors (kg)	
2.3.1	Roof structure	2.3.1 Roof structure Angle Fillets	170.00	m2	Aluminium capping (by area)	ASSUME 1 M HIGH
2.3.1	Roof structure	2.3.1 Roof structure Flat Slab (Concrete)	160.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.3.1	Roof structure	2.3.1 Roof structure Flat Slab (Reinforcement)	21,600.00	kg	Reinforcement Bar - Roof (kg)	
2.3.1	Roof structure	2.3.1 Roof structure Capping	170.00	lm	Frame - Structural Steel, Universal Beam (lm)	
2.3.1	Roof structure	2.3.1 Roof structure Corner Capping	30.00	lm	Frame - Structural Steel, Universal Beam (lm)	Assume 3m Length per Angle
2.3.1	Roof structure	2.3.1 Roof structure Junction Sealing			No Datapoint. Absorbed within 10% scheme-wide allowance.	
2.3.1	Roof structure	2.3.1 Roof structure Projecting Canopy	10.00	m2	Canopy 15mm glass and aluminium box louvers supported by steel pipe	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
2.3.1	Roof structure	2.3.1 Roof structure Tray Flashing	50.00	m2	Aluminium capping (by area)	ASSUME 1 M HIGH
2.3.1	Roof structure	2.3.1 Roof structure Upstands				
2.3.1	Roof structure	2.3.1 Roof structure Upstands (Concrete)	14.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.3.1	Roof structure	2.3.1 Roof structure Upstands (Reinforcement)	1,680.00	kg	Reinforcement Bar - Roof (kg)	
2.3.2	Roof coverings	2.3.2 Roof coverings Biodiverse Roof	250.00	m2	Green Roof (irrigated), Bitumen, EPS	
2.3.2	Roof coverings	2.3.2 Roof coverings Hot Melt Roofing	622.00	m2	Warm Roof, Bitumen over EPS substrate	
2.3.4	Roof drainage	2.3.4 Roof drainage Pipes	40.00	lm	Gutter - PVC	Assume 3m Length per RW
2.3.4	Roof drainage	2.3.4 Roof drainage RW Outlets			Included in Row 63	
2.4.1	Stair/ramp structures	2.4.1 Stair/ramp structures Crane Infills			Assumed Considered Under RICS PS A5 Assumption	
2.4.1	Stair/ramp structures	2.4.1 Stair/ramp structures Staircase				
2.4.1	Stair/ramp structures	2.4.1 Stair/ramp structures Staircase (Concrete)	35.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.4.1	Stair/ramp structures	2.4.1 Stair/ramp structures Staircase (Reinforcement)	4,725.00	kg	Reinforcement Bar - Stairs/Ramps (kg)	
		2.4.3 Stair/ramp balustrades and handrails Metal Hand Railing	100.00	lm	Steel handrail 50mm diam	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Blockwork	20.12	m2	140mm Concrete Block Core Filled, internal finish, no fd	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Brickwork	60.12	m2	Masonry Wall - Double Brick (90/50/90)+fd	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Concrete				
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Concrete Walls (Concrete)	300.00	m3	Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3)	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Concrete Walls (Reinforcement)	36,000.00	kg	Reinforcement Bar - External Walls (kg)	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level DPC	7.08	m2	*Vapour Barrier/Damp Proof Membrane (DPM) - External Walls, Polyethylene, 0.2mm (m2)*	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level DPM	110.00	m2	*Vapour Barrier/Damp Proof Membrane (DPM) - External Walls, Polyethylene, 0.2mm (m2)*	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Facing Brickwork	3,941.86	m2	*Masonry Wall - Single Brick (110mm)*	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Lime Stone Wall	9.44	m2	*Limestone Wall, 250mm thick, with concrete mortar*	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level PC Lintols	24.00	lm	*External Works - Precast Concrete Barrier Kerbs (lm)*	Assumed 600mm Length
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Precast Coping	23.51	lm	*External Works - Precast Concrete Barrier Kerbs (lm)*	
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Service Trench	3.38	m3	*Substructure - Large scale excavation (assembly only)*	Assume 150mm Width & 150mm Depth
2.5.1	External enclosing walls above ground level	2.5.1 External enclosing walls above ground level SFS Cement Board System	3,843.84	m2	Wall Cladding, 7.5mm Compressed Fibre cement board, m2	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
2.6.1	External Windows	2.6.1 External Windows Aluminium Double Glazed Windows	1.00	m2	*Windows, Commercial, Aluminium Double Glaze*	
2.6.1	External Windows	2.6.1 External Windows Architraves	1,237.50	m2	*Wall Lining, Prefinished painted 12mm MDF*	
2.6.1	External Windows	2.6.1 External Windows Window Boards	1,237.50	m2	*Wall Lining, Prefinished painted 12mm MDF*	
2.6.2	External Doors	2.6.2 External Doors Door Entry System			No Datapoint. Absorbed within 10% scheme-wide allowance.	
2.6.2	External Doors	2.6.2 External Doors Double Door	3.00	#	*Door - Glazed Aluminium Frame, Aluminium Jamb*	
2.6.2	External Doors	2.6.2 External Doors Entrance Door	1.00	#	*Door - Glazed Aluminium Frame, Aluminium Jamb*	
2.6.2	External Doors	2.6.2 External Doors Roof Access	1.00	#	Door - Glazed Aluminium Frame, Aluminium Jamb	
2.6.2	External Doors	2.6.2 External Doors Single Door	3.00	#	Door - Glazed Aluminium Frame, Aluminium Jamb	
2.7.1	Walls and partitions	2.7.1 Walls and partitions Blockwork Walls	1,256.00	m2	140mm Concrete Block Core Filled, internal finish, no fd	
2.7.1	Walls and partitions	2.7.1 Walls and partitions Fire Boarding Insulation	300.00	m2	Frame - fire boarding, 16mm (m2)	
2.8.1	Internal Doors	2.8.1 Internal Doors Internal Doors	926.00	#	Door - HollowCoreTimber/WoodenJam/painted	
2.8.1	Internal Doors	2.8.1 Internal Doors			Included in Row 108	
3.1.1	Wall Finishes	3.1.1 Wall Finishes Emulsion Painting	1,256.00	m2	Internal Finish (walls) - Paint (water based)	
3.1.1	Wall Finishes	3.1.1 Wall Finishes			Included in Row 110	
3.1.1	Wall Finishes	3.1.1 Wall Finishes Plastering Walls	756.00	m2	Wall Finish - 5mm Plaster Skim Coat (m2)	
3.2.1	Floor Finishes	3.2.1 Finishes to floors Floor Tiling			Included in Row 114	
3.2.1	Floor Finishes	3.2.1 Finishes to floors Line & Level Bathroom Pods	82.00	units	Shower-bath Unit (ceramic)	
3.2.1	Floor Finishes	3.2.1 Finishes to floors Screed	295.55	m3	Screed - Upper Floors, 1:4 concrete/sand, unreinforced (m3)	Assumed 50mm Thickness
3.2.1	Floor Finishes	3.2.1 Finishes to floors Stair Nosing	15.12	m2	Covering - Zinc Coated Steel Sheeting, 0.6mm, flat profile (50 yrs)	Assumed 50mm Thickness
3.2.1	Floor Finishes	3.2.1 Finishes to floors Treads	15.12	m2	Covering - Zinc Coated Steel Sheeting, 0.6mm, flat profile (50 yrs)	Assumed 50mm Thickness
3.2.1	Floor Finishes	3.2.1 Finishes to floors Wood Flooring	5,911.00	m2	Floor Covering - 13mm Hardwood, Timber Floating Floor with Acoustic Underlay	
3.3.1	Ceiling Finishes	3.3.1 Finishes to ceilings Access Panels	55.00	m2	Wall Lining, 12mm Plasterboard, painted, m2	Assume 1m x 1m Access Panels
4.1.1	General FFE	4.1.1 General fittings, furnishings and equipment Base Unit Cupboards			No Datapoint. Absorbed within 10% scheme-wide allowance.	
4.1.1	General FFE	4.1.1 General fittings, furnishings and equipment Kitchen Fittings			No Datapoint. Absorbed within 10% scheme-wide allowance.	
4.1.1	General FFE	4.1.1 General fittings, furnishings and equipment Signage	1.00	m2	Internal Signage	Assume 1m x 1m Signage
4.1.1	General FFE	4.1.1 General fittings, furnishings and equipment Wardrobes			No Datapoint. Absorbed within 10% scheme-wide allowance.	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
4.1.1	General FFE	4.1.1 General fittings, furnishings and equipment White Goods			No Datapoint. Absorbed within 10% scheme-wide allowance.	
5.1.1	Sanitary	5.1.1 Sanitary appliances Bathroom Pods	55.00	units	Shower-bath Unit (ceramic)	
5.1.1	Sanitary	5.1.1 Sanitary appliances Shower Pods	27.00	units	Shower-bath Unit (ceramic)	
5.10.1	Lifts	5.10.1 Lifts and Enclosed Hoists Lifts	1.00	#	Elevator Car, Passenger (no counter weight)	
5.11.3	Lighting Protection	5.11.3 Lightning Protection Lightning Protection	1.00	#	Lightning Protector	
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations Mechanical Installations			Included in Services	
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations Electrical Installation	5,229.20	m2	Electrical Fittings - sockets, power points, wiring, embodied only (m2	Assume 85% from GIA
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations Indoor Lighting	5,229.20	m2	LED Outdoor Lighting (Residential - Standard Efficiency 80lm/watt) , m2	Assume 85% from GIA
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations HVAC Unit	1.00	#	HVAC Water Cooled VRF Unit (22.5kW output	Assume 1 no
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations Fancoil Unit	53.34	#	HVAC Fan Coil Unit Embodied	Calculated from Previous Model
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations Heat Recovery Ventilation Unit	5,229.20	m2	Heat Recovery Ventilation Unit - Basic Controls	Assume 1 no Each in Every Apartment
5.13.4	Specialist electrical/ electronic installations	5.13.4 Specialist electrical/ electronic installations PV's	54.74	kw	Solar PV System, Residential, Embodied Only	Reference : CLHM PV Panel System 77 Panels produce 32.3 kWP, Therefore : 1 Panel =2.38 kWP
5.3.1	Foul drainage above ground	5.3.1 Foul drainage above ground Precast Manholes	1.25	#	Sewerage - Junction pit or manhole 1.2 dia	
5.7.2	Local and Special Ventilation	5.7.2 Local and Special Ventilation uPVC Ducts	150.00	lm	HVAC Ducting PVC 100mm dia, 5mm thick (lm)	
5.7.2	Local and Special Ventilation	5.7.2 Local and Special Ventilation			Included in Row 142	
5.8.1	Electrical mains and sub-mains distribution	5.8.1 Electrical mains and sub-mains distribution Electrical Installations			Included in Services	
8.1.1	Site clearance	8.1.1 Site clearance Bed & Surround	0.27	m2	External Works - Precast Concrete Paving, 25MPa, 60mm thick (m2)	Assumed 150mm Depth
8.1.1	Site clearance	8.1.1 Site clearance Concrete Covering	37.08	m2	External Works - Precast Concrete Paving, 25MPa, 60mm thick (m2)	Assumed 150mm Depth
8.1.1	Site clearance	8.1.1 Site clearance Drainage Trench	0.04	m3	Substructure - Large scale excavation (assembly only)	Assume 150mm Width & 150mm Depth
8.1.1	Site clearance	8.1.1 Site clearance Excavate Pits	41.67	m3	Substructure - Large scale excavation (assembly only)	
8.1.1	Site clearance	8.1.1 Site clearance Excavation	173.29	m3	Substructure - Large scale excavation (assembly only)	
8.1.1	Site clearance	8.1.1 Site clearance Hazz	392.68	m3	Substructure - Large scale excavation (assembly only)	
8.1.1	Site clearance	8.1.1 Site clearance Material Fill	242.20	m3	External Works - Excavation, Backfilling & Compaction, Assembly only, 5yrs (m3) (Keep only Backfilling)	
8.1.1	Site clearance	8.1.1 Site clearance Site Cut	261.79	m3	Substructure - Large scale excavation (assembly only)	
8.1.1	Site clearance	8.1.1 Site clearance Stone Base	12.50	m3	External Works - 150mm Compacted Limestone (30 yrs)	
8.1.1	Site clearance	8.1.1 Site clearance Stone Top	12.48	m3	External Works - 150mm Compacted Limestone (30 yrs)	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
8.1.1	Site clearance	8.1.1 Site clearance Topsoil	133.56	m3	External Works - Soil at 600mm depth (m3)	
8.1.1	Site clearance	8.1.1 Site clearance Trenches	5.18	m3	Substructure - Large scale excavation (assembly only)	Assume 150mm Width & 150mm Depth
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Aggregate Filling	105.45	m3	External Works - Aggregate, 5 yrs (m3)	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Concrete Founds	22.16	m3	Poured Concrete - External Works, Paving, 25MPa (m3)	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Form Ramps	14.96	m3	Poured Concrete - External Works, Paving, 25MPa (m3)	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Granite Kerbs	109.08	lm	Kerbs - Granite Barrier	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Granite Paving	249.49	m2	External Works - Granite Paving (795x395x40mm)	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Gravel Strip	0.61	m3	External Works - Aggregate, 5 yrs (m3)	Assumed 50mm Thickness
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Level & Compaction			Assumed Considered Under RICS PS A5 Assumption	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings RC Founds			Included in Row 165	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Resin Bound Aggregate	7.09	m3	External Works - Aggregate, 5 yrs (m3)	Assumed 50mm Thickness
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Rubber Mulch	34.84	m2	Landscaping - Rubber Play Ground Surface	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Sand Blinding	31.58	m3	External Works - Sand Bed, 5 yrs (m3)	Assumed 50mm Thickness
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Steel Edgings	137.73	lm	Kerbs - Granite Barrier	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Stone Paving	189.09	m2	External Works - 90mm Limestone Paving, 150 yrs (m2)	
8.2.1	Roads, paths and pavings	8.2.1 Roads, paths and pavings Terram Membrane	41.67	m2	Roof covering - gravel ballast, corflute and geotextile (Remove Ballast)	
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Benches	2.00	#	Cast Iron Bench	Assumed 2 Benches
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Bins	3.56	#	Plastic coated wire bin	
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Concrete Planters			No Datapoint. Absorbed within 10% scheme-wide allowance.	
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Concrete Tables			No Datapoint. Absorbed within 10% scheme-wide allowance.	
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Cycle Stands			No Datapoint. Absorbed within 10% scheme-wide allowance.	
8.5.1	Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Seating	17.81	#	Cast Iron Bench	
8.7.1	Water mains	8.7.1 Water mains supply Bends	21.37	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply Branch Connection	32.06	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply Gullies	8.01	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply Linear Drain	17.81	lm	100mm PVC Sanitary water Pipes	

Appendix 1 - Inputs

NRM	Cateogory	Description	LCA Model Qty	LCA Model Unit	LCA Model Datapoint	Assumptions
8.7.1	Water mains	8.7.1 Water mains supply PPIC's	16.03	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply RWP's	8.01	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply SVP's	8.01	lm	100mm PVC Sanitary water Pipes	Assumed 1 nr of Pipe is 3m
8.7.1	Water mains	8.7.1 Water mains supply uPVC Pipes	159.21	lm	100mm PVC Sanitary water Pipes	
8.7.9	External street lighting systems	8.7.9 External street lighting systems External Lighting	0.18	#	Lighting Residential LED bulbs (outdoor)	
8.7.9	External street lighting systems	8.7.9 External street lighting systems Lighting Bollards	17.81	#	Lighting Residential LED bulbs (outdoor)	
8.7.9	External street lighting systems	8.7.9 External street lighting systems Street Lighting	3.56	#	Lighting Residential LED bulbs (outdoor)	

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
1	Substructure	Bulk Aggregates Sands and Soils | Aggregate | Gravel (High quallity e.g. blasted crushed and screened)	720,384	150	Inert Waste Landfill	-	-
1	Substructure	Bulk Aggregates Sands and Soils | Sand | Unspecified	86,376	150	Inert Waste Landfill	-	-
1	Substructure	Cementitious Binders | Mortars and Renders | 1 cement : 4 sand	1,980	200	Inert Waste Landfill	-	-
1	Substructure	Cementitious Binders | Portland Cement | Unspecified	3,469	150	Inert Waste Landfill	-	-
1	Substructure	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 30% BFS	2,126,528	150	Inert Waste Landfill	-	-
1	Substructure	Concrete | Unreinforced | Portland Cement Blends | 20 MPa	16,379	150	Inert Waste Landfill	-	-
1	Substructure	Concrete | Unreinforced | Portland Cement Blends | 40 MPa	11,646	150	Inert Waste Landfill	-	-
1	Substructure	Concrete | Unreinforced | Portland Cement Blends | Unspecified	19,375	200	Inert Waste Landfill	-	-
1	Substructure	Ferrous Metals | Steel | Reinforcement bar | Unspecified	71,413	150	Steel products 20% Landfill, 80% Recycled	-	57,130.29
1	Substructure	Insulation | Blankets and Batts | 80% Recycled Polyester Batts | Unspecified	274	50	Plastics Landfill	-	-
1	Substructure	Insulation | Blankets and Batts | Mineral Wool | Blanket | Unspecified	1,866	50	Inert Waste Landfill	-	-
1	Substructure	Metals (Non-Ferous) | Aluminium Unspecified	221	200	Aluminium 43% Landfill, 57% Recycled	-	126.72
1	Substructure	Plastics | General | Unspecified	206	50	Plastics Landfill	-	-
1	Substructure	Plastics | High Density Polyethylene (HDPE) | Unspecified	189	200	Plastics 98% Landfill, 2% Recycled	-	3.45
1	Substructure	Roofing | Membranes | Polyester bitumen	18,660	150	Plastics Landfill	-	-
1	Substructure	Timber | Sustainably Sourced | Plywood | Unspecified	1,510	100	Wood Landfill	-	-
2.1	Superstructure: Frame	Asphalt and Bitumen | Asphalt hot mix | 4.50% primary bitumen (20% RAP)	4	30	Inert Waste Landfill	-	-
2.1	Superstructure: Frame	Bulk Aggregates Sands and Soils | Aggregate | Gravel (High quallity e.g. blasted crushed and screened)	272	30	Inert Waste Landfill	-	-
2.1	Superstructure: Frame	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 20% BFS	536,400	150	Inert Waste Landfill	-	-
2.1	Superstructure: Frame	Concrete | Unreinforced | Portland Cement Blends | 25 MPa	626	27	Inert Waste Landfill	-	-
2.1	Superstructure: Frame	Ferrous Metals | Steel | General | Unspecified	1	150	Steel products 20% Landfill, 80% Recycled	-	0.80
2.1	Superstructure: Frame	Ferrous Metals | Steel | Reinforcement bar | Unspecified	56,900	150	Steel products 20% Landfill, 80% Recycled	-	45,520.00
2.1	Superstructure: Frame	Insulation | Rigid Foams and Boards | Polyethylene | Polyethylene	0	15	Plastics Landfill	-	-
2.1	Superstructure: Frame	Resins and Adhesives | Mastic Sealant	1	15	Plastics Landfill	-	-
2.2	Superstructure: Upper Floors	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 20% BFS	3,170,720	150	Inert Waste Landfill	-	-
2.2	Superstructure: Upper Floors	Ferrous Metals | Steel | Accessories | Unspecified	2,215	150	Steel products 20% Landfill, 80% Recycled	-	1,771.78
2.2	Superstructure: Upper Floors	Ferrous Metals | Steel | Galvanised Structural | Unspecified	8,188	150	Steel products 20% Landfill, 80% Recycled	-	6,550.65
2.2	Superstructure: Upper Floors	Ferrous Metals | Steel | Reinforcement bar | Unspecified	179,550	150	Steel products 20% Landfill, 80% Recycled	-	143,640.00
2.3	Superstructure: Roof	Asphalt and Bitumen | Asphalt hot mix | 5.50% primary bitumen, (0% RAP)	5,000	100	Inert Waste Landfill	-	-

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
2.3	Superstructure: Roof	Asphalt and Bitumen | Bitumen, rubberised 40% rubber	3,844	60	Plastics Landfill	-	-
2.3	Superstructure: Roof	Bulk Aggregates Sands and Soils | Soil | Unspecified	50,000	50	No Disposal Process	-	-
2.3	Superstructure: Roof	Carpets and Floor Coverings | Underlay | Felt	31	50	Woollen carpet Landfill	-	-
2.3	Superstructure: Roof	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 20% BFS	33,376	150	Inert Waste Landfill	-	-
2.3	Superstructure: Roof	Ferrous Metals | Steel | Galvanised Structural | Unspecified	9,971	150	Steel products 20% Landfill, 80% Recycled	-	7,976.80
2.3	Superstructure: Roof	Ferrous Metals | Steel | Hot Rolled | Unspecified	1	150	Steel products 20% Landfill, 80% Recycled	-	0.88
2.3	Superstructure: Roof	Ferrous Metals | Steel | Reinforcement bar | Unspecified	23,280	150	Steel products 20% Landfill, 80% Recycled	-	18,624.00
2.3	Superstructure: Roof	Ferrous Metals | Steel | Stainless | Unspecified	2,813	150	Steel products 20% Landfill, 80% Recycled	-	2,250.31
2.3	Superstructure: Roof	Gases | Refrigerants | R-744 (CO2)	(720)	25	Refrigerant Gas R-744 (CO2) loss	-	-
2.3	Superstructure: Roof	Glazing | Glass and Films | Flat Glass	25,448	50	Glass Land Fill	-	-
2.3	Superstructure: Roof	Insulation | Rigid Foams and Boards | Polystyrene | Unspecified EPS	3,510	75	Plastics Landfill	-	-
2.3	Superstructure: Roof	Metals (Non-Ferous) | Aluminium Unspecified	7,823	100	Aluminium 43% Landfill, 57% Recycled	-	4,484.78
2.3	Superstructure: Roof	Plastics | High Density Polyethylene (HDPE) | Unspecified	675	50	No Disposal Process	-	135.00
2.3	Superstructure: Roof	Plastics | High Density Polyethylene (HDPE) | Unspecified	625	50	Plastics 80% Landfill, 20% Recycled	-	125.00
2.3	Superstructure: Roof	Plastics | Polyvinyl Chloride (PVC) | PVC Pipe	114	80	Plastics 80% Landfill, 20% Recycled	-	22.72
2.3	Superstructure: Roof	Plastics | Polyvinyl Chloride (PVC) | Unspecified	2,208	200	Plastics 80% Landfill, 20% Recycled	-	441.67
2.3	Superstructure: Roof	Resins and Adhesives | Urea Formaldehyde	18	50	Plastics Landfill	-	-
2.3	Superstructure: Roof	Timber | Sustainably Sourced | Plywood | Unspecified	576	75	Wood Landfill	-	-
2.3	Superstructure: Roof	Timber | Sustainably Sourced | Softwood | Unspecified	1,181	75	Wood Landfill	-	-
2.4	Superstructure: Stairs and Ramps	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 20% BFS	83,440	150	Inert Waste Landfill	-	-
2.4	Superstructure: Stairs and Ramps	Ferrous Metals | Steel | Reinforcement bar | Unspecified	4,725	150	Steel products 20% Landfill, 80% Recycled	-	3,780.00
2.4	Superstructure: Stairs and Ramps	Ferrous Metals | Steel | Stainless | Unspecified	248	50	Steel products 20% Landfill, 80% Recycled	-	198.45
2.5	Superstructure: External Walls	Asphalt and Bitumen | Asphalt hot mix | 4.50% primary bitumen (20% RAP)	33	30	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Bricks, Blocks and Pavers | Clay Bricks and Pavers | Unspecified	538,312	150	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Bulk Aggregates Sands and Soils | Aggregate | Gravel (High quallity e.g. blasted crushed and screened)	2,155	30	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Cementitious Binders | Mortars and Renders | 1 cement : 4 sand	113,374	200	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Concrete | Reinforced | 1.0% Reinforcement | Portland Cement Blends | 30 MPa	7,046	150	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Concrete | Unreinforced | Blast Furnace Slag Blends | 40 MPa | 20% BFS	715,200	150	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Concrete | Unreinforced | Portland Cement Blends | 25 MPa	4,959	27	Inert Waste Landfill	-	-

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
2.5	Superstructure: External Walls	Concrete | Unreinforced | Portland Cement Blends | 40 MPa	1,679	150	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Concrete | Unreinforced | Portland Cement Blends | Unspecified	3,315	200	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Ferrous Metals | Steel | Galvanised Structural | Unspecified	23	83	Steel products 20% Landfill, 80% Recycled	-	18.51
2.5	Superstructure: External Walls	Ferrous Metals | Steel | General | Unspecified	37	150	Steel products 20% Landfill, 80% Recycled	-	29.47
2.5	Superstructure: External Walls	Ferrous Metals | Steel | Reinforcement bar | Unspecified	36,000	150	Steel products 20% Landfill, 80% Recycled	-	28,800.00
2.5	Superstructure: External Walls	Insulation | Rigid Foams and Boards | Polyethylene | Polyethylene	2	15	Plastics Landfill	-	-
2.5	Superstructure: External Walls	Metals (Non-Ferous) | Aluminium Unspecified	20	200	Aluminium 43% Landfill, 57% Recycled	-	11.34
2.5	Superstructure: External Walls	Paints and Finishes | Water Based | 1 Coat	2	10	Plastics Landfill	-	-
2.5	Superstructure: External Walls	Plaster and Mineral Derived Products | 100% Primary Gypsum | Plasterboard | Unspecified Sheets	249	39	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Plaster and Mineral Derived Products | Fibre Cement | Compressed 1750kg/m3	50,450	60	Inert Waste Landfill	-	-
2.5	Superstructure: External Walls	Plastics | High Density Polyethylene (HDPE) | Unspecified	743	150	Plastics 81% Landfill, 19% Recycled	-	142.22
2.5	Superstructure: External Walls	Resins and Adhesives | Mastic Sealant	9	15	Plastics Landfill	-	-
2.5	Superstructure: External Walls	Rock and Stone | Cut or Split | Limestone	1,571	150	Inert Waste Landfill	-	-
2.6	Superstructure: Windows and External Doors	Ferrous Metals | Steel | General | Unspecified	37	40	Steel products 20% Landfill, 80% Recycled	-	29.72
2.6	Superstructure: Windows and External Doors	Ferrous Metals | Steel | Stainless | Unspecified	3	150	Steel products 20% Landfill, 80% Recycled	-	2.40
2.6	Superstructure: Windows and External Doors	Glazing | Windows | Aluminium Framed | No Thermal Break | Single Glaze | Domestic 50% Opening	170	44	Inert Waste Landfill	-	-
2.6	Superstructure: Windows and External Doors	Glazing | Windows | Aluminium Framed | Thermal Break | Double Glaze | Commercial Fixed	36	44	Inert Waste Landfill	-	-
2.6	Superstructure: Windows and External Doors	Metals (Non-Ferous) | Aluminium Extruded	39	150	Aluminium 43% Landfill, 57% Recycled	-	22.29
2.6	Superstructure: Windows and External Doors	Paints and Finishes | Unspecified | 1 Coat	0	6	Plastics Landfill	-	-
2.6	Superstructure: Windows and External Doors	Paints and Finishes | Unspecified | 3 Coats	371	40	Plastics Landfill	-	-
2.6	Superstructure: Windows and External Doors	Plastics | General | Unspecified	3	20	No Disposal Process	-	-
2.6	Superstructure: Windows and External Doors	Rubber | Synthetic	2	20	No Disposal Process	-	-
2.6	Superstructure: Windows and External Doors	Timber | Sustainably Sourced | Medium Density Fibreboard (MDF) | Unspecified	11,138	40	Wood Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Cementitious Binders | Mortars and Renders | 1 cement : 4 sand	25,120	200	Inert Waste Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Concrete | Unreinforced | Portland Cement Blends | 40 MPa	104,801	150	Inert Waste Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Concrete | Unreinforced | Portland Cement Blends | Unspecified	206,926	200	Inert Waste Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Ferrous Metals | Steel | Galvanised Structural | Unspecified	1,444	83	Steel products 20% Landfill, 80% Recycled	-	1,155.52
2.7	Superstructure: Internal Walls and Partitions	Ferrous Metals | Steel | General | Unspecified	584	83	Steel products 20% Landfill, 80% Recycled	-	467.23
2.7	Superstructure: Internal Walls and Partitions	Metals (Non-Ferous) | Aluminium Unspecified	502	200	Aluminium 43% Landfill, 57% Recycled	-	288.03

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
2.7	Superstructure: Internal Walls and Partitions	Paints and Finishes | Water Based | 1 Coat	126	10	Plastics Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Plaster and Mineral Derived Products | 100% Primary Gypsum | Plasterboard | Unspecified Sheets	15,512	39	Inert Waste Landfill	-	-
2.7	Superstructure: Internal Walls and Partitions	Plaster and Mineral Derived Products | Fibre Cement | Compressed 1750kg/m3	8,400	80	Inert Waste Landfill	-	-
3	Finishes	Bulk Aggregates Sands and Soils | Sand | Unspecified	529,626	150	Inert Waste Landfill	-	-
3	Finishes	Carpets and Floor Coverings | Underlay | Rubber	4,729	45	Plastics Landfill	-	-
3	Finishes	Cementitious Binders | Portland Cement | Unspecified	109,945	150	Inert Waste Landfill	-	-
3	Finishes	Ceramics | Porcelain Sanitary Products | Bath	5,330	75	Inert Waste Landfill	-	-
3	Finishes	Ferrous Metals | Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.56mm	71	50	Steel products 20% Landfill, 80% Recycled	-	56.97
3	Finishes	Ferrous Metals | Steel | General | Unspecified	34	50	Steel products 20% Landfill, 80% Recycled	-	27.06
3	Finishes	Ferrous Metals | Steel | Stainless | Unspecified	1,090	42	Steel products 20% Landfill, 80% Recycled	-	872.00
3	Finishes	Glazing | Glass and Films | Flat Glass	1,968	25	Glass Land Fill	-	-
3	Finishes	Metals (Non-Ferous) | Copper Unspecified	508	150	Copper 52% Landfill, 48% Recycled	-	243.72
3	Finishes	Paints and Finishes | Unspecified | 1 Coat	317	10	Plastics Landfill	-	-
3	Finishes	Plaster and Mineral Derived Products | 100% Primary Gypsum | Plaster | Unspecified	4,234	39	Inert Waste Landfill	-	-
3	Finishes	Plaster and Mineral Derived Products | 100% Primary Gypsum | Plasterboard | 12mm Sheets	627	39	Inert Waste Landfill	-	-
3	Finishes	Plastics | Polyvinyl Chloride (PVC) | PVC Pipe	106	200	Plastics 80% Landfill, 20% Recycled	-	21.27
3	Finishes	Timber | Sustainably Sourced | General | Unspecified	53,824	42	Wood Landfill	-	-
3	Finishes	Timber | Sustainably Sourced | Hardwood | Unspecified	57,632	45	Wood Landfill	-	-
4	Fittings, furnishings & equipment (FFE)	Metals (Non-Ferous) | Aluminium Unspecified	5	40	No Disposal Process	-	3.10
4	Fittings, furnishings & equipment (FFE)	Paints and Finishes | Solvent Based | 1 Coat	0	40	Plastics Landfill	-	-
5	Services (MEP)	Bulk Aggregates Sands and Soils | Aggregate | Gravel (High quallity e.g. blasted crushed and screened)	5,138	150	Inert Waste Landfill	-	-
5	Services (MEP)	Ceramics | Porcelain Sanitary Products | Bath	5,330	75	Inert Waste Landfill	-	-
5	Services (MEP)	Concrete | Prefabricated Components | Precast Concrete Panels	12,123	150	Inert Waste Landfill	-	-
5	Services (MEP)	Concrete | Unreinforced | Portland Cement Blends | Unspecified	13	25	Inert Waste Landfill	-	-
5	Services (MEP)	Ferrous Metals | Steel | Coated Sheet | Galvanised (zinc coated)	75	50	Steel products 20% Landfill, 80% Recycled	-	60.26
5	Services (MEP)	Ferrous Metals | Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm	196	15	Steel products 20% Landfill, 80% Recycled	-	156.88
5	Services (MEP)	Ferrous Metals | Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.56mm	105	15	Steel products 20% Landfill, 80% Recycled	-	83.78
5	Services (MEP)	Ferrous Metals | Steel | General | Unspecified	1,134	50	Steel products 20% Landfill, 80% Recycled	-	907.56
5	Services (MEP)	Ferrous Metals | Steel | Reinforcement bar | Unspecified	1,289	150	Steel products 20% Landfill, 80% Recycled	-	1,031.41

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
5	Services (MEP)	Ferrous Metals | Steel | Stainless | Unspecified	1,031	100	Steel products 20% Landfill, 80% Recycled	-	824.51
5	Services (MEP)	Finished Products | Electrical Goods | Electric Motors | Unspecified	190	15	Electric motor Landfill	-	-
5	Services (MEP)	Finished Products | Electrical Goods | Electronics | Electronics For Control Unit	72	7.5	Electronics Disposal	-	-
5	Services (MEP)	Finished Products | Electrical Goods | Solar Inverters | Solar Inverter Generic	3	10	inverters Landfill	-	-
5	Services (MEP)	Finished Products | Electrical Goods | Solar PV Panels | Monocystalline	57	25	Recycling solar panels	-	-
5	Services (MEP)	Gases | Refrigerants | R-410A (Puron, AZ-20)	3	20	No Disposal Process	-	-
5	Services (MEP)	Glazing | Glass and Films | Flat Glass	2,072	25	Glass Land Fill	-	-
5	Services (MEP)	Insulation | Rigid Foams and Boards | Polyethylene | Polyethylene	4	20	Plastics Landfill	-	-
5	Services (MEP)	Metals (Non-Ferous) | Aluminium Unspecified	77	50	Aluminium 43% Landfill, 57% Recycled	-	43.96
5	Services (MEP)	Metals (Non-Ferous) | Copper Unspecified	4,794	150	Copper 52% Landfill, 48% Recycled	-	2,301.26
5	Services (MEP)	Metals (Non-Ferous) | Titanium	11	25	Non-ferrous metals Landfill	-	-
5	Services (MEP)	Plastics | ABS | Unspecified	72	15	Plastics 80% Landfill, 20% Recycled	-	14.40
5	Services (MEP)	Plastics | General | Unspecified	3,602	30	Plastics Landfill	-	-
5	Services (MEP)	Plastics | Nylon | Unspecified	7	50	Plastics 80% Landfill, 20% Recycled	-	1.30
5	Services (MEP)	Plastics | Polypropylene | Injection Moulding	19	100	Plastics Landfill	-	-
5	Services (MEP)	Plastics | Polyvinyl Chloride (PVC) | PVC Pipe	432	200	Plastics 80% Landfill, 20% Recycled	-	86.30
5	Services (MEP)	Resins and Adhesives | Urea Formaldehyde	25	50	Plastics Landfill	-	-
5	Services (MEP)	Rubber | Synthetic	279	20	Plastics Landfill	-	-
8	External works	Asphalt and Bitumen | Asphalt hot mix | 4.50% primary bitumen (20% RAP)	291	30	Inert Waste Landfill	-	-
8	External works	Asphalt and Bitumen | Asphalt hot mix | 5.50% primary bitumen, (0% RAP)	173	80	Inert Waste Landfill	-	-
8	External works	Bulk Aggregates Sands and Soils | Aggregate | Gravel (High quallity e.g. blasted crushed and screened)	383,827	150	Inert Waste Landfill	-	-
8	External works	Bulk Aggregates Sands and Soils | Sand | Unspecified	107,142	150	Inert Waste Landfill	-	-
8	External works	Bulk Aggregates Sands and Soils | Soil | Unspecified	267,130	150	No Disposal Process	-	-
8	External works	Cementitious Binders | Mortars and Renders | 1 cement : 4 sand	1,833	80	Inert Waste Landfill	-	-
8	External works	Cementitious Binders | Mortars and Renders | Adhesive Mortar (Tiling)	6,175	80	Inert Waste Landfill	-	-
8	External works	Concrete | Unreinforced | Portland Cement Blends | 25 MPa	125,887	80	Inert Waste Landfill	-	-
8	External works	Ferrous Metals | Iron | Unspecified	890	100	Steel products 28% Landfill, 72% Recycled	-	638.89
8	External works	Ferrous Metals | Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm	38	15	Steel products 20% Landfill, 80% Recycled	-	30.00
8	External works	Ferrous Metals | Steel | General | Unspecified	4	15	Steel products 20% Landfill, 80% Recycled	-	3.59

Appendix 2 - Materials

NRM	Cateogory	Material	Mass of raw materials (kg)	Service life	EOL Process	Estimated reusable materials (kg)	Estimated recyclable materials (kg)
8	External works	Ferrous Metals | Steel | Reinforcement bar | Unspecified	2,346	50	Steel products 20% Landfill, 80% Recycled	-	1,876.55
8	External works	Finished Products | Electrical Goods | Light Fittings | Flourescent Globes	25	10	No Disposal Process	-	-
8	External works	Glazing | Glass and Films | Flat Glass	19	15	Glass Land Fill	-	-
8	External works	Insulation | Rigid Foams and Boards | Polyethylene | Polyethylene	10	15	Plastics Landfill	-	-
8	External works	Plastics | General | Unspecified	0	15	Plastics Landfill	-	-
8	External works	Plastics | Polyurethane | Unspecified	174	15	Plastics Landfill	-	-
8	External works	Plastics | Polyvinyl Chloride (PVC) | PVC Pipe	165	75	Plastics 80% Landfill, 20% Recycled	-	33.10
8	External works	Resins and Adhesives | Epoxy Resin	299	80	Plastics Landfill	-	-
8	External works	Resins and Adhesives | Mastic Sealant	48	15	Plastics Landfill	-	-
8	External works	Rock and Stone | Cut or Split | Limestone	40,844	150	Inert Waste Landfill	-	-
8	External works	Rock and Stone | Cut or Split | Slate	57,754	80	Inert Waste Landfill	-	-
8	External works	Rock and Stone | Polished | Granite / Basalt / Marble	27,384	80	Inert Waste Landfill	-	-
8	External works	Roofing | Membranes | Polyester bitumen	1,250	150	Plastics Landfill	-	-
8	External works	Rubber | Synthetic	732	15	Plastics Landfill	-	-
	Total		10,976,570			-	333,068

Appendix 3 - Emissions

NRM Cateogory	Description		Biogenic Carbon	A1A3	A4	*A5	B1	*B2	*B3	B4	B5	B6	B7	*C1	C2	C3	C4	D
1.1.1.Standard foundations	1.1.1 Standard foundations Piling & Foundation (Concrete)			326,649	41,498	25,384		-	-	-				1,747	35,604	-	12,463	-
1.1.1.Standard foundations	1.1.1 Standard foundations Piling & Foundation (Reinforcement) (Reinforcement Bar - Foundations, 12mm)			83,545	6,874	6,492		-	-	-				170	4,602	-	64	3,903
1.1.1.Standard foundations	1.1.1 Standard foundations Terram Layer (Roof covering - gravel ballast, corflute and geotextile (m2))			25,127	13,550	1,953		-	-	-				20	410	-	148	-
1.1.1.Standard foundations	1.1.1 Standard foundations Trenches (Substructure - Large scale excavation (assembly only))			-	918	-		-	-	-				-	-	-	-	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Aggregate Blinding (Substructure - Aggregate Infill, 150 yrs (m3))			6,487	11,156	504		-	-	-				454	9,188	-	3,311	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Bed & Surround (Substructure - Aggregate Infill, 150 yrs (m3))			4,693	8,235	365		-	-	-				329	6,647	-	2,395	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Flat Slab (Concrete)			79,188	10,235	6,154		-	-	-				424	8,631	-	3,021	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Lift Pits (Concrete)			35,634	4,734	2,769		-	-	-				191	3,884	-	1,360	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction DPM (Vapour Barrier/Damp Proof Membrane (DPM)/Geotextile - Foundations, Polyethylene, 0.2mm (m2))			465	171	36		-	-	-				0	4	-	1	-
2.1.4.Concrete frames	2.1.4 Concrete frames Concrete Frame (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			111,357	14,298	8,653		-	-	-				596	12,138	-	4,249	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Flat Slab (Reinforcement) (Reinforcement Bar - Foundations, 12mm)			44,094	3,633	3,427		-	-	-				90	2,429	-	34	2,060
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Floor Insulation (Insulation Blanket - Lowest Floor, Polyester/Rockwool Blend Foil-faced Blanket, 140mm (m2))			5,549	541	431		397	99	6,258				6	137	-	19	(767)
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Formwork (Formwork - Foundations (m3))		(1,045)	-	887	-		-	-	-				37	25	-	985	(70)
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Gas Membrane (Vapour Barrier/Damp Proof Membrane (DPM)/Geotextile - Foundations, Polyethylene, 0.2mm (m2))			465	171	36		-	-	-				0	4	-	1	-
2.2.1.Floors	2.2.1 Floors Flat Slab (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			658,246	83,620	51,152		-	-	-				3,521	71,747	-	25,114	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Lift Pits (Reinforcement) (Reinforcement Bar - Foundations, 12mm)			17,638	1,457	1,371		-	-	-				36	972	-	14	824
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Sand Blinding (Substructure - Sand Bed, Compacted, 150yrs (m3))			843	3,878	66		-	-	-				76	1,531	-	552	-
2.3.1.Roof structure	2.3.1 Roof structure Flat Slab (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			79,188	10,235	6,154		-	-	-				424	8,631	-	3,021	-
2.1.1.Steel frames	2.1.1 Steel frames Secondary Steelwork (Frame - Structural Steel, Unspecified General Steel (kg))			15,763	2,141	1,225		-	-	-				42	1,131	-	16	(2,870)
2.4.1.Stair and ramp structures	2.4.1 Stair/ramp structures Staircase (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			17,322	2,421	1,346		-	-	-				93	1,888	-	661	-
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Brickwork/Blockwork (Wall, 200mm Hollow Concrete Block, Unfinished, m2)			5,274	1,056	410		-	-	-				24	494	-	169	(37)
1.1.3.Lowest floor construction	1.1.3 Lowest floor construction Concrete Blinding (Screed - Lowest Floor, 1:4 concrete/sand, unreinforced (m3))			3,711	1,157	288		-	-	-				22	444	-	160	-
1.1.5.Basement retaining walls	1.1.5 Basement retaining walls Retaining Walls (Retaining Wall 350mm insitu concrete 1% by mass reo, 1.0% reo by volume)			6,389	1,706	497		-	-	-				50	721	-	651	34
2.2.1.Floors	2.2.1 Floors Flat Slab (Reinforcement) (Reinforcement Bar - Upper Floors (kg))			407,029	29,602	31,630		-	-	-				749	20,314	-	284	(21,246)
2.2.1.Floors	2.2.1 Floors Metal Floors (Floor Structure - Profiled Metal Deck (Superstructure) (m2))			28,034	1,651	2,179		-	-	-				43	1,177	-	16	(4,666)

Appendix 3 - Emissions

NRM Cateogory	Description		Biogenic Carbon	A1A3	A4	*A5	B1	*B2	*B3	B4	B5	B6	B7	*C1	C2	C3	C4	D
2.3.1.Roof structure	2.3.1 Roof structure Angle Fillets (Aluminium capping (by area))			5,617	847	436		-	-	-				14	384	-	3	(1,748)
2.3.1.Roof structure	2.3.1 Roof structure Capping (Frame - Structural Steel, Universal Beam, Galvanised (lm))			20,916	2,329	1,625		-	-	-				35	959	-	13	(2,514)
2.3.1.Roof structure	2.3.1 Roof structure Corner Capping (Frame - Structural Steel, Universal Beam, Galvanised (lm))			3,691	493	287		-	-	-				6	169	-	2	(444)
2.1.4.Concrete frames	2.1.4 Concrete frames Concrete Frame (Reinforcement) (Reinforcement Bar - Frames/Columns/Beams (kg))			116,857	9,325	9,081		-	-	-				237	6,438	-	90	5,459
2.3.1.Roof structure	2.3.1 Roof structure Flat Slab (Reinforcement) (Reinforcement Bar - Roof (kg))			44,361	3,540	3,447		-	-	-				90	2,444	-	34	2,072
2.3.1.Roof structure	2.3.1 Roof structure Projecting Canopy (Canopy 15mm glass and aluminium box louvers supported by steel pipe)			72,857	11,367	5,662		2,696	674	42,503				204	3,737	-	1,872	(19,777)
2.3.1.Roof structure	2.3.1 Roof structure Tray Flashing (Aluminium capping (by area))			1,652	253	128		-	-	-				4	113	-	1	(514)
2.1.4.Concrete frames	2.1.4 Concrete frames PC Lintols (External Works - Precast Concrete Barrier Kerbs (lm))			123	1,777	10		151	38	2,380				1	20	-	7	-
2.3.1.Roof structure	2.3.1 Roof structure Upstands (Reinforcement) (Reinforcement Bar - Roof (kg))			3,450	280	268		-	-	-				7	190	-	3	161
2.3.2.Roof coverings	2.3.2 Roof coverings Biodiverse Roof (Green Roof (irrigated), Bitumen, EPS)			16,724	4,931	1,300		540	135	8,518				1	725	-	(702)	(18)
2.3.2.Roof coverings	2.3.2 Roof coverings Hot Melt Roofing (Warm Roof, Bitumen over EPS substrate)			18,328	4,800	1,424		9	2	144				14	329	-	56	(646)
2.3.4.Roof drainage	2.3.4 Roof drainage Pipes (Gutter - PVC)			87	39	7		-	-	-				0	5	-	0	(0)
2.3.1.Roof structure	2.3.1 Roof structure Upstands (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			6,929	1,108	538		-	-	-				37	755	-	264	-
2.4.1.Stair and ramp structures	2.4.1 Stair/ramp structures Staircase (Reinforcement) (Reinforcement Bar - Stairs/Ramps (kg))			9,704	777	754		-	-	-				20	535	-	7	453
2.4.1.Stair and ramp structures	2.4.3 Stair/ramp balustrades and handrails Metal Hand Railing (Steel handrail 50mm diam)			717	60	56		84	21	1,319				1	28	-	0	(682)
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Blockwork (140mm Hollow Concrete Block Core Filled, ext unfinished, int PB furring, no fd)			1,586	601	123		17	4	260				7	139	-	45	(35)
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Brickwork (Masonry Wall - Double Brick (90/50/90)+fd)			7,585	3,035	589		-	-	-				26	541	-	181	(27)
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Concrete Walls (Concrete) (Poured Concrete - Upper Floors, 40MPa, 20% BFS (m3))			148,477	18,987	11,538		-	-	-				794	16,183	-	5,665	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Concrete Walls (Reinforcement) (Reinforcement Bar - External Walls (kg))			73,934	5,900	5,745		-	-	-				150	4,073	-	57	3,454
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level DPC (Vapour Barrier/Damp Proof Membrane (DPM) - External Walls, Polyethylene, 0.2mm (m2))			5	9	0		-	-	-				0	0	-	0	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level DPM (Vapour Barrier/Damp Proof Membrane (DPM) - External Walls, Polyethylene, 0.2mm (m2))			82	32	6		-	-	-				0	1	-	0	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Facing Brickwork (Masonry Wall - Single Brick (110mm)+fd)			241,870	101,424	18,795		-	-	-				729	15,033	-	5,032	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Lime Stone Wall (Limestone Wall, 250mm thick, with concrete mortar)			1,136	173	88		-	-	-				3	54	-	19	(3)
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level PC Lintols (External Works - Precast Concrete Barrier Kerbs (lm))			491	1,851	38		219	55	3,459				4	81	-	29	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Precast Coping (External Works - Precast Concrete Barrier Kerbs (lm))			481	1,849	37		218	54	3,429				4	79	-	28	-

Appendix 3 - Emissions

NRM Cateogory	Description		Biogenic Carbon	A1A3	A4	*A5	B1	*B2	*B3	B4	B5	B6	B7	*C1	C2	C3	C4	D
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level Service Trench (Substructure - Large scale excavation (assembly only))			-	914	-		-	-	-				-	-	-	-	-
2.5.1.External enclosing walls above ground level	2.5.1 External enclosing walls above ground level SFS Cement Board System (Wall Cladding, 7.5mm Compressed Fibre cement board, m2)			67,101	8,659	5,214		-	-	-				58	1,196	-	400	-
2.6.1.External Windows	2.6.1 External Windows Aluminium Double Glazed Windows (Windows, Commercial, Aluminium Double Glaze)			78	315	6		26	6	403				0	1	-	0	-
2.6.1.External Windows	2.6.1 External Windows Architraves (Wall Lining, Prefinished painted 12mm MDF)		(8,016)	-	9,795	-		899	225	14,179				389	277	-	10,424	(1,506)
2.6.1.External Windows	2.6.1 External Windows Window Boards (Wall Lining, Prefinished painted 12mm MDF)		(8,016)	-	9,795	-		899	225	14,179				389	277	-	10,424	(1,506)
2.6.2.External doors	2.6.2 External Doors Double Door (Door - Glazed Aluminium Frame, Aluminium Jamb)			791	186	61		58	15	922				1	17	-	1	(77)
2.6.2.External doors	2.6.2 External Doors Entrance Door (Door - Glazed Aluminium Frame, Aluminium Jamb)			264	104	20		28	7	438				0	6	-	0	(26)
2.6.2.External doors	2.6.2 External Doors Roof Access (Door - Glazed Aluminium Frame, Aluminium Jamb)			264	104	20		28	7	438				0	6	-	0	(26)
2.6.2.External doors	2.6.2 External Doors Single Door (Door - Glazed Aluminium Frame, Aluminium Jamb)			791	186	61		58	15	922				1	17	-	1	(77)
2.7.1.Walls and Partitions	2.7.1 Walls and partitions Blockwork Walls (140mm Hollow Concrete Block Core Filled, ext unfinished, int PB furring, no fd)			98,959	19,335	7,690		866	217	13,655				416	8,648	-	2,802	(2,160)
2.7.1.Walls and Partitions	2.7.1 Walls and partitions Fire Boarding Insulation (Frame - fire boarding, 16mm (m2))			11,172	1,564	868		-	-	-				10	199	-	67	-
2.8.1.Internal Doors	2.8.1 Internal Doors Internal Doors (Door - HollowCoreTimber/WoodenJam/painted)		(78,405)	-	13,296	-		1,179	295	18,584				1,883	1,430	-	50,378	(9,793)
3.1.1.Wall Finishes	3.1.1 Wall Finishes Emulsion Painting (Internal Finish (walls) - Paint (water based)(3 coats))			1,005	682	78		307	77	4,833				0	10	-	3	(14)
3.1.1.Wall Finishes	3.1.1 Wall Finishes Plastering Walls (Wall Finish - 5mm Plaster Skim Coat (m2))			1,222	786	95		139	35	2,196				5	96	-	34	-
3.2.1.Finishes to floors	3.2.1 Finishes to floors Line & Level Bathroom Pods (Shower-bath Unit (ceramic))			10,894	5,527	847		433	108	6,832				16	390	-	61	(1,007)
3.2.1.Finishes to floors	3.2.1 Finishes to floors Screed (Screed - Upper Floors, 1:4 concrete/sand, unreinforced (m3))			117,594	29,496	9,138		-	-	-				695	14,059	-	5,066	-
3.2.1.Finishes to floors	3.2.1 Finishes to floors Stair Nosing (Roof Covering - Zinc Coated Steel Sheeting, 0.6mm, flat profile (50 yrs))			237	26	18		17	4	273				0	8	-	0	(122)
3.2.1.Finishes to floors	3.2.1 Finishes to floors Treads (Roof Covering - Zinc Coated Steel Sheeting, 0.6mm, flat profile (50 yrs))			237	26	18		17	4	273				0	8	-	0	(122)
3.2.1.Finishes to floors	3.2.1 Finishes to floors Wood Flooring (Floor Covering - 13mm Hardwood, Timber Floating Floor with Acoustic Underlay)		(85,177)	-	15,661	-		(504)	(126)	(7,950)				2,015	1,478	-	53,963	(7,646)
3.3.1.Finishes to ceilings	3.3.1 Finishes to ceilings Access Panels (Wall Lining, 12mm Plasterboard, painted, m2)			272	155	21		39	10	614				1	15	-	5	(1)
4.1.1.General fittings, furnishings and equipment	4.1.1 General fittings furnishings and equipment Signage (Internal Signage)			34	11	3		3	1	47				0	2	-	0	(20)
5.1.1.Sanitary appliances	5.1.1 Sanitary appliances Bathroom Pods (Shower-bath Unit (ceramic))			7,307	3,710	568		291	73	4,585				11	262	-	41	(676)
5.1.1.Sanitary appliances	5.1.1 Sanitary appliances Shower Pods (Shower-bath Unit (ceramic))			3,587	1,838	279		143	36	2,261				5	128	-	20	(332)
5.10.1.Lifts and Enclosed Hoists	5.10.1 Lifts and Enclosed Hoists Lifts (Elevator Car, Passenger (no counter weight))			2,261	456	176		525	131	8,275				4	118	-	3	(1,068)
5.11.3.Lightning Protection	5.11.3 Lightning Protection Lightning Protection (Lightning Protector)			2,355	136	183		-	-	-				4	95	-	1	(1,112)
5.13.4.Specialist electrical/electronic installations	5.13.4 HVAC Residential Split System Air Source Heat Pump (MEPs Average)			1,032	429	80	182,790	7,550	1,887	119,027				2,031	30	-	55,853	(209)
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations Electrical Installation (Electrical Fittings - sockets, power points, wiring, embodied only (m2))			21,989	5,542	1,709		831	208	13,098				54	1,448	-	44	(3,884)
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations Fancoil Unit (HVAC Fan Coil Unit Embodied)			1,947	476	151		382	96	6,023				4	97	-	4	(435)

Appendix 3 - Emissions

NRM Cateogory	Description		Biogenic Carbon	A1A3	A4	*A5	B1	*B2	*B3	B4	B5	B6	B7	*C1	C2	C3	C4	D
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations Heat Recovery Ventilation Unit (Heat Recovery Ventilation Unit - Basic Controls)			1,351	185	105		256	64	4,044				1	32	-	2	(425)
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations HVAC Unit (HVAC Water Cooled VRF Unit (22.5kW output))			624	142	48		930	233	14,665				188	30	-	5,139	(226)
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations Indoor Lighting (LED Outdoor Lighting (Residential - Standard Efficiency 80lm/watt) , m2)			1,839	398	143		739	185	11,653				1	19	-	2	(664)
5.13.4.Specialist electrical/electronic installations	5.13.4 Specialist electrical/ electronic installations PV's (Solar PV System, Residential, Embodied Only)			44,449	3,104	3,454		5,734	1,433	90,396				115	812	2,333	9	(30,349)
5.3.1.Foul drainage above the ground	5.3.1 Foul drainage above ground Precast Manholes (Sewerage - Junction pit or manhole 1.2 dia)			5,497	3,621	427		15	4	241				23	482	-	139	29
5.7.2.Local and Special Ventilation	5.7.2 Local and Special Ventilation uPVC Ducts (HVAC Ducting PVC 100mm dia, 5mm thick (lm))			952	305	74		84	21	1,326				2	50	-	2	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Bed & Surround (External Works - Precast Concrete Paving, 25MPa, 60mm thick (m2))			8	1,761	1		220	55	3,465				0	3	-	1	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Concrete Covering (External Works - Precast Concrete Paving, 25MPa, 60mm thick (m2))			1,170	2,247	91		685	171	10,803				21	421	-	150	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Drainage Trench (Substructure - Large scale excavation (assembly only))			-	914	-		-	-	-				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Excavate Pits (Substructure - Large scale excavation (assembly only))			-	918	-		-	-	-				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Excavation (Substructure - Large scale excavation (assembly only))			-	1,260	-		-	-	-				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Hazz (Substructure - Large scale excavation (assembly only))			-	1,616	-		-	-	-				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Material Fill (External Works - Excavation, Backfilling & Compaction, Assembly only, 5yrs (m3))			-	2,733	-		11,360	2,840	179,092				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Site Cut (Substructure - Large scale excavation (assembly only))			-	1,274	-		-	-	-				-	-	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Stone Base (External Works - 150mm Compacted Limestone (30 yrs))			65	1,582	5		120	30	1,887				4	84	-	30	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Stone Top (External Works - 150mm Compacted Limestone (30 yrs))			65	1,582	5		120	30	1,886				4	84	-	30	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Topsoil (External Works - Soil at 600mm depth (m3))			2,153	6,859	167		-	-	-				213	5,872	-	-	-
8.1.1.Preparatory groundworks	8.1.1 Site clearance Trenches (Substructure - Large scale excavation (assembly only))			-	914	-		-	-	-				-	-	-	-	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Aggregate Filling (External Works - Aggregate, 5 yrs (m3))			3,666	6,060	285		12,453	3,113	196,331				257	5,192	-	1,871	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Concrete Founds (Poured Concrete - External Works, Paving, 25MPa (m3))			9,537	1,642	741		2,554	638	40,259				57	1,166	-	408	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Form Ramps (Poured Concrete - External Works, Paving, 25MPa (m3))			6,438	1,205	500		1,742	436	27,468				39	787	-	275	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Granite Kerbs (Kerbs - Granite Barrier)			5,640	29,441	438		166	42	2,620				55	1,152	-	371	199
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Granite Paving (External Works - Granite Paving , 40mm, 80yrs (m2))			33,183	2,878	2,579		-	-	-				37	749	-	268	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Gravel Strip (External Works - Aggregate, 5 yrs (m3))			21	35	2		72	18	1,143				1	30	-	11	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Resin Bound Aggregate (External Works - Aggregate, 5 yrs (m3))			246	407	19		837	209	13,197				17	349	-	126	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Rubber Mulch (Landscaping - Rubber Play Ground Surface)			3,276	1,289	255		748	187	11,793				18	364	-	131	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Sand Blinding (External Works - Sand Bed, 5 yrs (m3))			856	1,814	67		3,560	890	56,129				77	1,555	-	560	-

Appendix 3 - Emissions

NRM Cateogory	Description		Biogenic Carbon	A1A3	A4	*A5	B1	*B2	*B3	B4	B5	B6	B7	*C1	C2	C3	C4	D
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Steel Edgings (Kerbs - Granite Barrier)			7,121	37,192	553		210	52	3,304				70	1,455	-	468	251
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Stone Paving (External Works - 90mm Limestone Paving, 150 yrs (m2))			16,724	5,230	1,300		-	-	-				173	3,505	-	1,263	-
8.2.1.Roads, paths and pavings	8.2.1 Roads paths and pavings Terram Membrane (Roof covering - gravel ballast, corflute and geotextile (m2))			1,683	908	131		-	-	-				1	27	-	10	-
8.5.1.Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Benches (Cast Iron Bench)			104	72	8		-	-	-				2	48	-	0	(50)
8.5.1.Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Bins (Plastic coated wire bin)			8	8	1		3	1	51				0	1	-	0	(5)
8.5.1.Site/street furniture and equipment	8.5.1 Site/street furniture and equipment Seating (Cast Iron Bench)			923	641	72		-	-	-				16	427	-	2	(443)
8.7.1.Water mains supply	8.7.1 Water mains supply Bends (100mm PVC Sanitary water Pipes)			37	63	3		-	-	-				0	2	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply Branch Connection (100mm PVC Sanitary water Pipes)			55	76	4		-	-	-				0	2	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply Gullies (100mm PVC Sanitary water Pipes)			14	50	1		-	-	-				0	1	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply Linear Drain (100mm PVC Sanitary water Pipes)			30	62	2		-	-	-				0	1	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply PPIC's (100mm PVC Sanitary water Pipes)			27	61	2		-	-	-				0	1	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply RWP's (100mm PVC Sanitary water Pipes)			14	50	1		-	-	-				0	1	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply SVP's (100mm PVC Sanitary water Pipes)			14	50	1		-	-	-				0	1	-	0	-
8.7.1.Water mains supply	8.7.1 Water mains supply uPVC Pipes (100mm PVC Sanitary water Pipes)			272	286	21		-	-	-				0	12	-	1	-
8.7.9.External/Street lighting systems	8.7.9 External street lighting systems External Lighting (Lighting Residential LED bulbs (outdoor))			360	97	28		122	30	1,916				0	5	-	7	(129)
8.7.9.External/Street lighting systems	8.7.9 External street lighting systems Lighting Bollards (Lighting Residential LED bulbs (outdoor))			360	97	28		122	30	1,916				0	5	-	7	(129)
8.7.9.External/Street lighting systems	8.7.9 External street lighting systems Street Lighting (Lighting Residential LED bulbs (outdoor))			360	97	28		122	30	1,916				0	5	-	7	(129)
RICS Default												**2,130,000**						
	TOTAL		(180,660)	3,260,882	682,048	253,400	182,790	61,520	15,380	969,875	-	2,130,000	-	20,917	300,816	2,333	272,304	(101,529)
	TOTAL / m2 GIFA		**(29)**	**530**	**111**	**41**	**30**	**10**	**3**	**158**	**-**	**346**	**-**	**3**	**49**	**0**	**44**	**(17)**

Source : RICS
1400kgCO2e/£100k
Construction Cost
18,100,000
253,400

Source : GLA	**Source : GLA**
1% A1-A5	25% B2
41,963	
10 x m2 GIA	
61,520	
61,520	**15,380**
Notes	**Notes**
above number represents whole scheme's B2 emission based on GLA guidance section 2.5.12	above number represents whole scheme's B3 emission based on GLA guidance section 2.5.12

B6, Regulated
1,200,000
B6, UnRegulated
930,000

Source : RICS
3.4 x m2 GIA
20,917
Notes
above number represents whole scheme's C1 emission based on RICS PS guidance section 3.5.4.1

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Statement of Competence

Anthony Waterman is an expert in Life Cycle Costing with over 20 years of professional experience. He currently sits on the BSI / ISO committee (TC59/SC14 WG 4 on Life Cycle Costing) working on the development of international standards on life cycle costing and maintenance of buildings and other constructed assets. This working group is responsible for the development of the international standards on life cycle costing and maintenance of buildings and other constructed assets, which are referred to in the BREEAM manual compliance notes.

Anthony Waterman's recognised qualification is an MSc in Construction Economics and Management from University College London, awarded in 2001. He is not professionally connected to a single manufacturer.

Harish Borah is an expert in Life Cycle Thinking (LCC & LCA) with 10+ years of professional experience. With continuous delivery of LCC/LCA assignment across geographies over the years, Harish has developed critical insights on the subject matter through practical application and engagement. His core competencies include calculating and reporting whole building carbon footprints; and further consulting on reduction of the same, while demonstrating value for money of design/specification alternatives.

Harish Borah's recognised qualification is a Distinction in MSc Commercial Project Managament from University of Manchester, awarded in 2014. Harish has further completed his Business Sustainability Management Program from the University of Cambridge in 2019. He is not professionally connected to a single manufacturer.

ADW Developments is made up of sustainability, life cycle assessment (LCA), and life cycle costing (LCC) experts who specialise in identifying and delivering best practice solutions for the built environment. The firm helps clients deliver projects that are economically viable and sustainable, assessing options for design, specification, and lifetime operation that provide both a positive return on investment and are good for the environment.

ADW Developments is a leading advisor to BRE providing best practice guidance, CPD Training, and support to them in their drafting of the BREEAM technical manual and compliance notes.

As such, ADW Developments offer both surety and probity that the Consultancy is best practice, unrivalled, and complaint with the expectations of BREEAM.

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