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EMBODIED CARBON REPORT

PROJECT: ROCHDALE ROAD - PHASE 2

CLIENT: MCGOFF CONSTRUCTION

DOCUMENT CONTROL

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1.0 EXECUTIVE SUMMARY

The Upfront Embodied carbon assessment has been prepared on behalf of **McGoff Construction** ('The Applicant') as part of the pre planning application to Greater Manchester Combined Authority (GMCA) for the development of **Rochdale Road-Phase 2** (the 'site').

The proposed development comprises the **erection of a 17-storey residential apartment building** (Use Class C3 (a), with associated access, amenity, landscaping, public realm, infrastructure and other associated works. The development includes the **demolition of existing vacant building on site**, comprising of ground floor retail and a first floor apartment.

This assessment has been undertaken in support of the pre-planning application and has been carried out in line with the guidance set out in GMCA's Net Zero Design Guidance – Part 1 and Part 3 – Submission Guidance.

The assessment should be read alongside the **Energy & Carbon Proforma submitted by Base Energy & Davies Partnership**, issued in Microsoft Excel Format and sets out the estimated emissions for the proposed development.

Metric	Result
Baseline Embodied Carbon (A1-C4)	437 kgCO ₂ e/m ²
Baseline Upfront Carbon (A1-A5)	309 kgCO ₂ e/m ²
GMCA PfE Upfront Carbon Targets (A1-A5)	600 kgCO ₂ e/m ² (large major developments)

Table1: Summary of the embodied carbon results of the proposed development.

A baseline upfront embodied carbon assessment (Modules A1–A5) has been completed using One Click LCA, in line with *RICS Whole Life Carbon Standard (2nd Edition)* and *GMCA Places for Everyone Policy JP-S2 and JP-S6*.

The resulting **Upfront Embodied Carbon (A1–A5)** is **309 kg CO₂e/m²** which is **below the GMCA PfE benchmark of 600 kg CO₂e/m²** for large major developments.

Total embodied carbon (A1–C4) is **437 kg CO₂e/m²**.

The assessment identifies **concrete as the principal contributor** to embodied carbon, reflecting the structural system of the 17-storey building. Measures incorporated within the design to reduce embodied carbon include the use of supplementary cementitious materials such as Ground Granulated Blast-furnace Slag (GGBS) in structural concrete, the use of prefabricated concrete façade panels, and recycled reinforcements where possible. These strategies support the project's alignment with industry embodied carbon benchmarks and reduction targets.

2.0 PROJECT DETAILS

- Site Location: 85, Rochdale Road, Greater Manchester, M4 4HY
- Project Stage: RIBA Stage 2 Feasibility (Pre-Application)
- Client: McGoff Construction
- Project Type: Residential Apartments (Large Major development)
- Gross Internal Area: 12325 m²
- Number of storeys: 17
- Number of Residential Units: 153



Figure 1: Proposed site plan of the project

3.0 SCOPE & METHODOLOGY

An embodied carbon assessment has been undertaken in accordance with the following standards and guidance:

- RICS Whole Life Carbon Assessment for the Built Environment (2nd Edition)
- Greater Manchester Places for Everyone Policy JP-S2 (Carbon and Energy)
- One Click LCA (OCLCA) software, applying the **EN 15978 life-cycle assessment methodology**
- Project Boundary: **Cradle to Construction (Modules A1-A5)** to align with GMCA policy
- Units of measurement: kgCO₂e, tonsCO₂e and kgCO₂e/m²

ASSESSMENT METHOD

One Click LCA was used to quantify material inventories and their associated embodied carbon impacts. Materials were modelled using datasets with Environmental Product Declarations (EPDs) where available.

It should be noted here that the LCA tool has a finite material database and not all specified material has available Environmental Product Declarations (EPD). In such cases, the closest representative dataset based on material composition is used.

The analysis considers the following building elements:

- Demolition – existing Victoria Inn building
- Facilitating works – temporary works like supports and site preparation
- Substructure – foundation and ground floor elements
- Superstructure – structural frame, upper floors, beams, roof structure, staircases
- Envelope – external walls and façade systems
- Internal elements - walls, partitions, finishes
- Openings - doors and windows
- Building Services (MEP) – electrical, heating, ventilation, water, wastewater, photovoltaic installations, lifts

The assessment has been undertaken at a **whole-building level**. A single carbon intensity value has therefore been applied across both residential and non-residential entries within the GMCA proforma, reflecting the consistent construction typology across the development at this stage.

4.0 DATA SOURCES & INPUTS

Building Element Group	Building Element	Basis for information
Demolition	Existing Victoria Inn (2 storey)	Existing site plan drawings and elevation drawings were used to estimate demolition quantities
	Site clearing	Allowance made for site clearance, including removal of debris and preparation of the site.
Facilitating works	Temporary works	An allowance for temporary works like supports and scaffolding was included in the assessment
Substructure	Pile, Pile caps, footing mats	Concrete and reinforcement quantities were provided by the structural engineers.
Superstructure	Frame, Upper floors, Roof	Concrete and reinforcement quantities were provided by the structural engineers. Additional quantities were extracted from OCLCA 3D Carbon designer and cross checked against architectural and structural drawings.
	External walls	Typical wall build-up assumed based on architectural design information and standard residential wall assemblies. In the absence of detailed façade sections, wall layers were estimated using OCLCA reference assemblies and industry rule-of-thumb assumptions.
	External Windows & doors	Glazing quantities were derived from architectural elevation drawings. External door quantities were estimated from architectural floor plans.
	Internal walls, partitions & Internal doors	Quantities derived using the OCLCA 3D Carbon Designer and industry rule-of-thumb assumptions.
Finishes	Wall, floor, ceiling finishes	Quantities were estimated using architectural floor plans, Gross Internal Area (GIA), and rule-of-thumb assumptions for internal finishes.
Building Services/MEP	Water, Wastewater, electrical, heating, ventilation	Service quantities were estimated using OCLCA GIA-based allocation factors. Major MEP equipment quantities were derived from the mechanical and electrical strategy.
Prefabricated buildings and building units	Prefab façade units	Quantities were derived from architectural elevation drawings.

Table 2: Data sources of the embodied carbon assessment

5.0 KEY ASSUMPTIONS & DESIGN SPECIFICATIONS

Foundation	The design assumes piled foundations and ground beams with 50% GGBS replacement in the concrete mix (CEM III/A equivalent) to reduce the substructure embodied carbon.
Frame	The structural frame comprises of in-situ reinforced concrete columns, shear walls, and structural slabs with 25% GGBS replacement within the concrete mix
Reinforcement	The baseline model assumes B500B/B500C reinforcement , representing commonly available reinforcement grades within the UK supply chain.
Envelope	The façade consists of prefabricated concrete panels forming the primary external envelope, with secondary architectural elements such as perforated metal louvres and metal panelling . Insulation and internal lining layers were included in the model based on typical residential façade assemblies in line with the current design intent.
Floors	Reinforced concrete slabs with sand-cement screed. Internal finishes modelled as a mix of engineered timber flooring and ceramic tiles.
Doors & Windows	Windows are assumed as double-glazed units with powder-coated aluminium frames . External doors are modelled as steel-framed units , while internal doors are assumed to be timber doors .
Internal	Lightweight galvanized steel stud partitions with acoustic insulation, finished with high-density plasterboard and low-VOC paint.
Services (MEP)	Standard residential provision for heating, ventilation, electrical and water installations, roof-mounted photovoltaic (PV) arrays.
Construction stage A5	Construction site emissions (Module A5) are currently based on benchmark values within the modelling software and will be refined at later design stages.
Use phase B1-B5	Repair and replacement cycles have been modelled based on typical service lives of building materials and systems .
End of Life C1-C4	Based on EPD data where available. In the absence of EPD specific data, the following have been considered. • Concrete: crushed and reused as aggregate • Steel/aluminium: recycling • Timber: Energy recovery via incineration

Table 3: Summarises the key assumptions made for different building elements/ materials

Transport distances and vehicle types were assumed based on typical UK construction supply chains and logistics. These assumptions will be refined at later design stages when material suppliers and procurement routes are confirmed.

Type of material	A2 (Raw material to Manufacturer)	A4 (Manufacturer to site)
Concrete	60 km – Rigid HGV (16-32t)	25 km – Rigid conc mixer truck
Steel	100 km – Articulated HGV (40t)	120 km – Articulated HGV (40t)
MEP & fixtures	150 km – Articulated HGV (40t)	200 km – Articulated HGV (40t)
Prefab concrete	100 km – Articulated HGV (40t)	120 km - Articulated HGV (40t)

Table 4: Summarises the key assumptions made for A2 and A4 transport modes and transport distances

6.0 RESULT

Assessment Scope	Embodied Carbon (kg CO ₂ e/m ² GIA)
Upfront Carbon (A1-A5)	309
A1-C4 (Total Embodied Carbon)	437
PfE Benchmark (A1-A5)	≤ 600 (Apartments)

Table 5: Summarises the project's embodied and upfront carbon results of the project.

The proposed development achieves an upfront embodied carbon value of **309 kgCO₂e/m² (Modules A1–A5)**, which is **within the GMCA Places for Everyone benchmark of 600 kgCO₂e/m² for large major residential developments**. The project therefore achieves approximately **48% reduction relative to the PfE benchmark**.

Life cycle stage	A1-A5	B1-B5	C1-C4	D (not included in totals)	Total
	kg CO ₂ e	kg CO ₂ e	kg CO ₂ e	kg CO ₂ e	kg CO ₂ e
0.1 Demolition			14,240		14,240
0.2 Facilitating works	8,955	0	0		8,955
1 Substructure	216,804	0	20,729	-38,573	237,532
2 Superstructure	2,704,736	495,247	93,796	-339,042	3,258,036
3 Finishes	123,200	284,520	116,713	-618,192	409,406
5 Building services (MEP)	384,849	554,671	3,965	-449,802	943,485
6 Prefabricated buildings and building units	374,082	124,807	5,056	-108,551	503,945
Total	3,812,626	1,459,244	254,498	-1,554,161	5,375,600
	309 kgCO ₂ e/m ²				437 kgCO ₂ e/m ²

Table 6. Embodied Carbon (A1-C4) result of the project Rochdale Road relative to UK Apartment buildings 2025.

Source: OneClick LCA export, (09-03-2026). For detailed information, see Appendix A

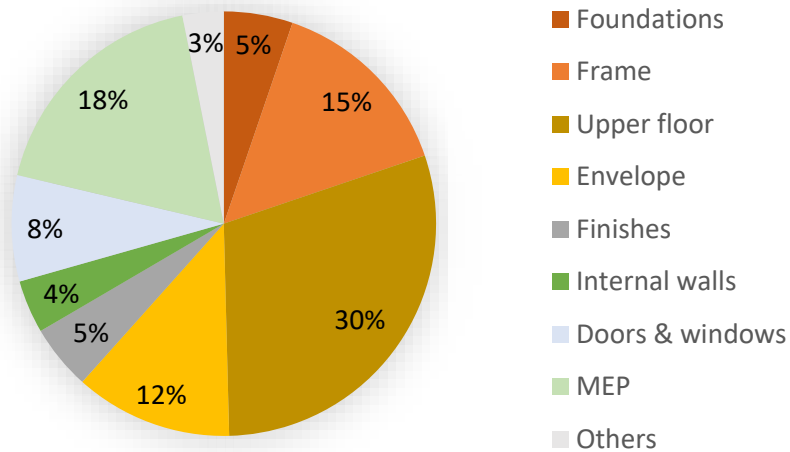


Figure 2. Total embodied carbon breakdown by building elements

Upper floor slabs represent the largest contributor to embodied carbon (30%), followed by building services (18%) and the structural frame (15%).

Source: OneClick LCA export, (09-03-2026)

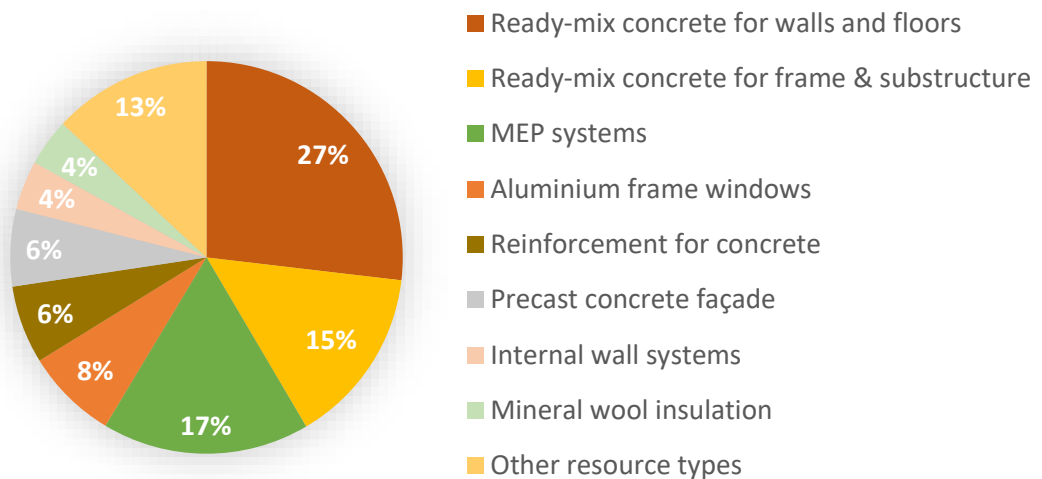


Figure 3. Total embodied carbon breakdown by material type for the proposed scheme

In-situ reinforced concrete account for approximately 48% of total embodied carbon, reflecting the structural system.

Source: OneClick LCA export, (09-03-2026)

ANALYSIS

The results indicate that in-situ **reinforced concrete is the primary contributor to the project's embodied carbon**, accounting for approximately **48% of total emissions** (see Figure 2). This reflects the structural system of the 17-storey building, where foundations, columns, shear walls and floor slabs are predominantly constructed from reinforced concrete.

As illustrated in Figure 1, **upper floor slabs and structural frame elements represent the largest individual contributors** to embodied carbon due to the significant material quantities required for these components.

The material breakdown (Figure 2) further highlights the dominance of ready-mix concrete and reinforcement, together with contributions from building services and façade components.

The life-cycle stage analysis (Figure 3) indicates that most emissions occur during the product and construction stages (Modules A1-A5). Emissions during the **use phase (Modules B1–B5)** are largely associated with **replacement impacts (Module B4)**. These arise primarily from building services, façade panels, doors, internal partitions and finishes that typically have **shorter service lives of approximately 15–20 years**, requiring replacement during the building lifecycle.

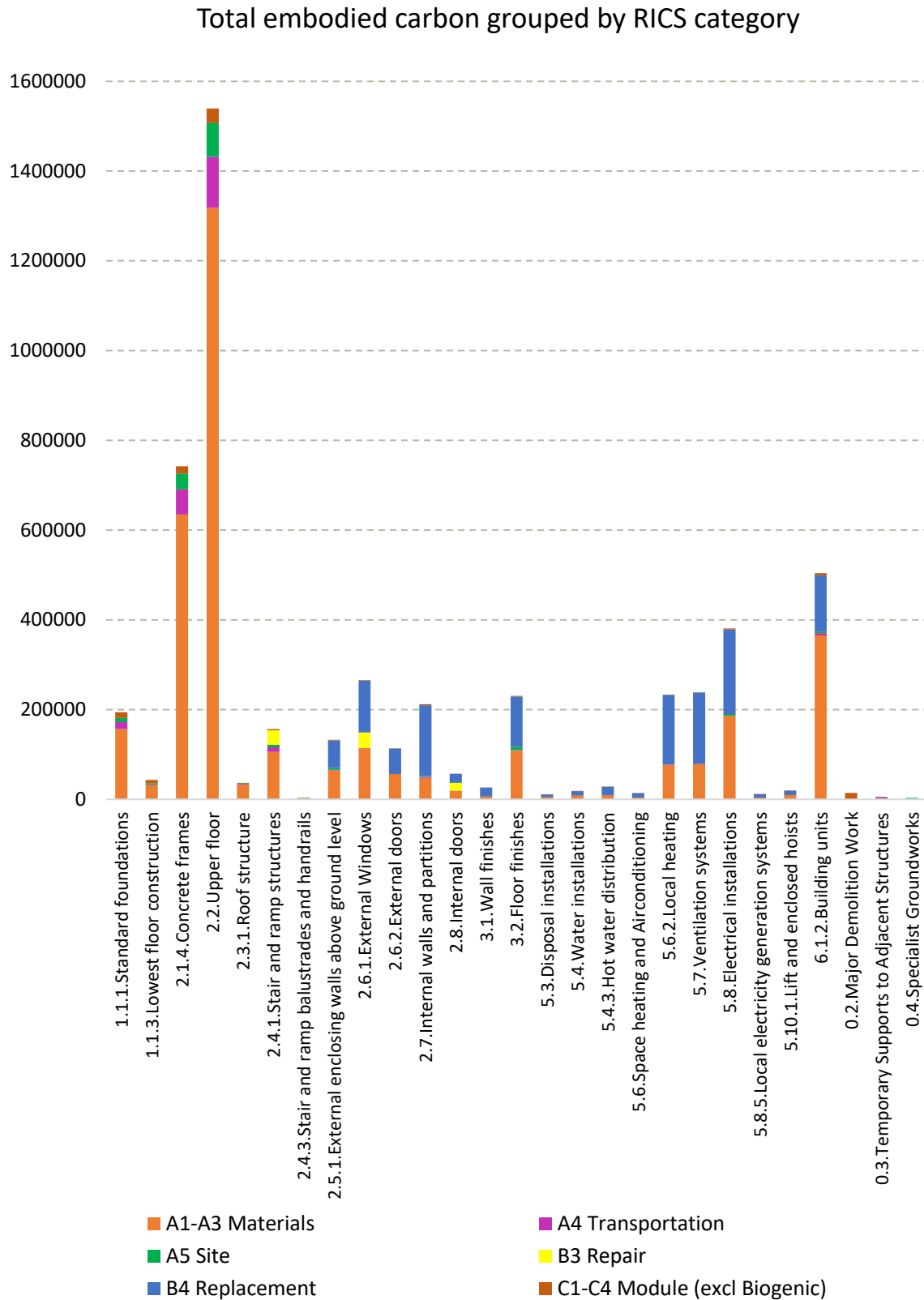


Figure 4. Total embodied carbon breakdown by RICS building element category.

Most of the emissions occur during the product stage (A1–A3), while use-stage emissions are primarily associated with replacement impacts (B4) from building services and internal components with shorter service lives.

Source: OneClick LCA export, (09-03-2026)

7.0 EMBODIED CARBON REDUCTION MEASURES IMPLEMENTED

1. Building Form Optimisation

The revised scheme consolidates the development into a single compact rectangular form, replacing the previous three-block arrangement.

This reduces the structural footprint and associated material quantities within foundations and ground floor construction. The revised form results in an approximately 45% reduction in embodied carbon compared with the previous scheme assessed in November 2025.

2. Structural Grid Optimisation

The simplified building form enables a **more efficient structural grid**, optimising column spacing, beam depths and slab design. This improves structural efficiency and reduces material quantities, while also enabling a more efficient layout of building services.

3. Use of Supplementary Cementitious Materials (GGBS)

Concrete mixes incorporate **GGBS** as a cement replacement to reduce embodied carbon. Current assumptions include:

- **25% GGBS replacement** within the structural frame
- **50% GGBS replacement** within foundations

These values will be further reviewed during technical design stages in collaboration with structural engineers and concrete suppliers.

4. Recycled Reinforcement

The model assumes **B500B/B500C reinforcement**, which is commonly produced in the UK using **Electric Arc Furnace (EAF) technology** with high recycled steel content. Final specifications will be confirmed during procurement.

5. Prefabricated concrete façade panels

The façade incorporates prefabricated concrete panels, which improve material efficiency through **factory-controlled production and reduce construction waste**. Precast systems also provide opportunities to incorporate supplementary cementitious materials such as GGBS within the concrete mix. In addition, prefabricated façade elements may support design-for-disassembly (DfD) strategies at end of life.

8.0 FUTURE REDUCTION STRATEGIES

The design team will continue to explore opportunities to further reduce embodied carbon as the project progresses to **RIBA Stages 3–4**, when material specifications, supplier information and construction methodologies will be confirmed.

The following material specification scenarios illustrate potential opportunities for further embodied carbon reductions during detailed design.

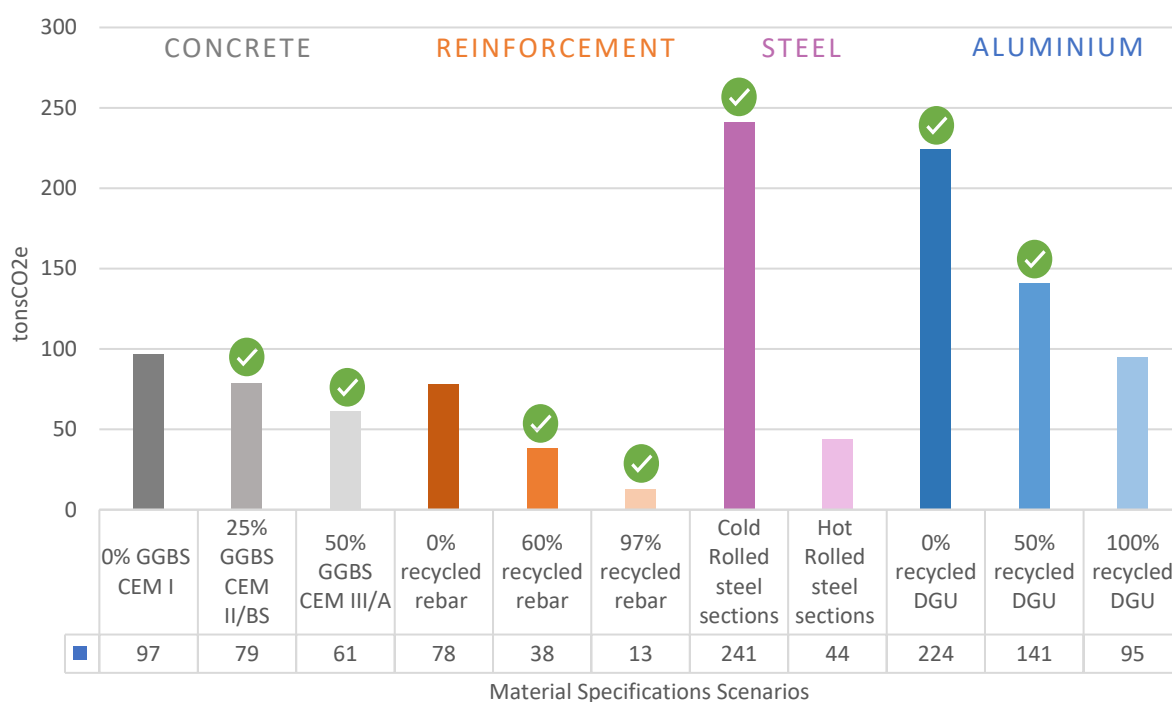


Figure 5. Indicative Embodied Carbon comparison of alternative material specifications.

Current material selections are indicated by green markers.

Source: Results from OCLCA, (09-03-2026)

Current Specification RIBA Stage 2	Target Strategy RIBA Stages 3–4	Notes
25% GGBS replacement in structural concrete frames	Increase GGBS replacement in structural concrete to 35–50% where feasible	Subject to supplier availability and structural requirements
50% GGBS replacement in foundations	Explore higher GGBS replacement levels 60–70% for foundation concrete where feasible	Dependent on curing requirements and supplier capabilities
Standard reinforcement specification	Specify reinforcement steel with 50–90% recycled content (EAF) where available	To be confirmed during procurement
Standard prefabricated concrete façade panels	Investigate the use of low-carbon concrete mixes & recycled reinforcement in prefabricated panels	Subject to architectural requirements
Standard metal louvres and panels	Procure façade metal elements with high recycled content or low-carbon aluminium	Early supplier engagement required
Generic material datasets (OneClick LCA defaults)	Replace generic datasets with product-specific EPD or TM65-compliant manufacturer data	To be confirmed during detailed design
Standard aluminum, steel, and metal components	Increase recycled material content in metal components where feasible	Subject to supplier availability and cost considerations

Table 7. Comparison of current and proposed strategies

These measures will be reviewed during technical design and procurement stages and incorporated into the final Whole Life Carbon assessment.

9.0 CONCLUSION

An upfront embodied carbon assessment has been undertaken for the proposed Rochdale Road development in accordance with the RICS Whole Life Carbon Assessment for the Built Environment (2nd Edition) and GMCA Places for Everyone guidance.

The development achieves an **upfront embodied carbon value of 309 kgCO₂e/m² (Modules A1–A5)**, which is **below the GMCA PfE benchmark of 600 kgCO₂e/m² for large major residential developments**.

The results indicate that the project performs well against current regional embodied carbon targets. This outcome is supported by the optimised building form, efficient structural grid, incorporation of supplementary cementitious materials (GGBS) within concrete mixes and the use of prefabricated façade systems.

As the project progresses into **RIBA Stages 3–4**, further opportunities for embodied carbon reduction will be explored through increased recycled material content, higher proportions of GGBS within concrete mixes and the specification of product-specific EPDs.

10.0 APPENDIX

1. **Appendix A** - Embodied Carbon Results by RICS Category (OneClick LCA Export)
2. **Appendix B** - Most Contributing materials
3. **Appendix C** - Material Dataset sources

10.1 Appendix A: Embodied Carbon Results by RICS Category

Entity users SN/ DP	Project Rochdale Road	Design name V2	Indicator name WLC assessment, RICS EN15804 +A2							GIA sqm 12325	Date of export 10/03/26	
Result category	Biogenic carbon (kg CO2e)	A1-A3 Product Stage	A4 Transport to site	A5 Site operation	B3 Repair	B4 Material replacement	C1 Demolition	C2 Waste transport	C3 Waste processing	C4 Disposal	TOTAL kg CO2e	D External impacts (not incl in totals)
0.1 Toxic Mat.												
0.2 Demolition							14239				14239	
0.3 Supports	0	2130	3066	519	0				0		5716	
0.4 Groundworks				3239							3239	
0.5 Diversion												
1 Substructure	0	187967	17072	11763	0			9601	9787	1339	237532	-38572
2.1 Frame	0	634724	55851	35339	0			14819	1393		742128	-114277
2.2 Upper Floors	0	1318212	113824	75029	0			29102	2716	485	1539370	-171159
2.3 Roof	0	32802	1465	1734	0			225	0	200	36428	
2.4 Stairs & Ramps	0	108118	10221	5840	31589			2585	248		158603	-22646
2.5 Ext. Walls	0	64403	1167	4069	0	61690		1369	40	88	132831	-307
2.6 Windows & Ext. Doors	-421	169870	737	0	34689	172471		1805	456	22	379632	-29584
2.7. Int. Walls & Partitions	0	47741	2123	2099	0	15748		2549	82		212084	-1066
2.8 Int. Doors	-35321	19057	301	0	17676	19640		73	35519	10	56957	0
3 Finishes	-115027	114662	1492	7044	0	131656		1010	115688	14	256542	-313877
4 FFE												
5 Services (MEP)	0	382552	917	5088	0	562118		3627	325	24	954656	-451710
6 Prefabricated	0	364932	5719	3430	0	124806		4546	506	3	503945	-108551
7 Existing building TOTAL kg CO2e	-150769	3447174	213961	155200	83955	1229872	14239	71318	166764	2188	5233907	-1251754
			3816336.									

10.2 Appendix B: Most Contributing materials

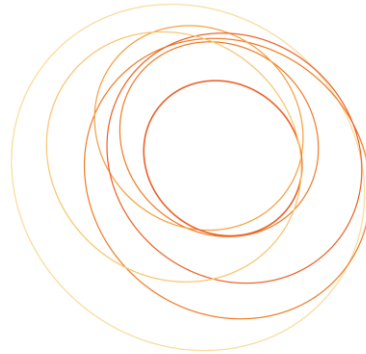
NO.	MATERIAL RESOURCE	A1-A3 tCO ₂ e	Share %
1	Ready-mix concrete , C32/40 (4600/5800 PSI), 25% GGBS	1064	30.9
2	Ready-mix concrete , C40/50 (5800/7300 PSI), 25% GGBS	549	15.9
3	Precast concrete facade for non-structural cladding	319	9.3
4	Reinforcement steel (rebar), diameter: 8-32 mm, B500B, B500C	289	8.4
5	Electrical distribution system, cabling and central switchboards	186	5.4
6	Stone wool (mineral wool) insulation, unfaced	145	4.2
7	Aluminium frame window double glazed, non-operable, 0% recycled aluminium	113	3.3
8	Ready-mix concrete, C30/37 (4400/5400 PSI), 10% (typical) recycled binders in cement	90	2.6
9	Mechanical ventilation system with heat recovery	78	2.3
10	Thermodynamic water heater	77	2.2
11	Engineered wood flooring, biogenic CO ₂ not subtracted	74	2.1
12	Ready-mix concrete for pile caps, C40/50, 50% GGBS cement	58	1.7
13	Steel door	56	1.6
14	Internal wall with improved sound insulation with steel studs and double panel gypsum board double siding	48	1.4
15	Ready-mix concrete, RC40/50 with 50% GGBS cement	39	1.1
16	Bitumen waterproofing membrane	33	1.0
17	Aluminium louvre blades for ventilation and sun control applications	32	0.9
18	Ceramic wall tiles	31	0.9
19	Gypsum plasterboard, 12.5 mm	22	0.6
20	Doors with wooden frame, interior	19	0.6
21	Ready-mix concrete, C32/40 (4600/5800 PSI), CEM III/A 50% GGBS content	15	0.4
22	External gypsum-based sheathing board	15	0.4
23	Anodised sheet for architectural cladding	13	0.4
24	Ready-mix concrete, C12/15 (1700/2200 PSI), 0% fly ash, CEM I	11	0.3
25	Extruded polystyrene (XPS) insulation	9.7	0.3

10.3 Appendix C: Material Dataset Sources

Material	Dataset / Product	Dataset Type	Source
Aluminium framed window (double glazed)	Aluminium window dataset	Generic	OneClick LCA
Aluminium handrail	Sightline aluminium handrail	EPD (product-specific)	EPD Hub
Aluminium louvre blades	DucoWall Classic W50Z	EPD (product-specific)	BRE
Anodised aluminium façade sheet	Aluminium façade sheet (55HX)	EPD (product-specific)	European Aluminium
Bitumen waterproofing membrane	IKO Permateg waterproofing system	EPD (product-specific)	EPD Hub
Ceramic floor tiles	Ceramic tiles dataset	Generic	OneClick LCA
Ceramic wall tiles	Seranit ceramic tiles	EPD (product-specific)	International EPD System
Concrete cleanliness layer (C12/15)	Lean concrete dataset	Generic	OneClick LCA
Internal wooden doors	Interior timber door dataset	EPD (product-specific)	INIES
Domestic water supply piping	Residential piping network dataset	Generic	OneClick LCA
Electric panel heater	Dimplex PLXE panel heater	EPD (product-specific)	BRE
Electrical distribution system	Electrical cabling and switchboards	Generic	OneClick LCA
Engineered wood flooring	Engineered timber flooring	EPD (product-specific)	INIES
External gypsum sheathing board	Klasse G-board	EPD (product-specific)	BRE
Extruded polystyrene (XPS) insulation	UK average XPS insulation dataset	Generic dataset	OneClick LCA
Gypsum plasterboard	GTEC plasterboard	EPD (product specific)	BRE
Internal gypsum stud wall system	Placostil® 72/48 wall system	EPD (FDES)	INIES
Mechanical ventilation system (MVHR)	DUPLEXbase PS 650	TM65 dataset	CIBSE TM65
Passenger elevator system with car and hoist system	Traction elevator system dataset	Generic dataset	OneClick LCA
Precast concrete façade	Laing O'Rourke Explore precast façade	EPD (product specific)	EPD Hub
Ready-mix concrete	ICE concrete dataset	Industry dataset	ICE database
Ready-mix concrete for pile caps	OXN-C40BC-001	EPD (product specific)	EPD Hub
Ready-mix concrete (generic mixes)	Generic concrete dataset	Generic dataset	OneClick LCA
Recycled crushed aggregate	Recycled MOT Type 1 sub-base	EPD (product specific)	EPD Hub
Reinforcement steel (rebar)	TOM2 reinforcing steel	EPD (product specific)	ITB
Roof mounted photovoltaic modules	Clearline Fusion PV16-405-M10	EPD (product specific)	International EPD System
Sewage drainage piping network	Residential drainage system dataset	Generic dataset	OneClick LCA
Stainless steel handrail	Stainless steel handrail	EPD (FDES)	INIES
Static hot water towel dryer	Banga Tahiti Flores Avonmore	EPD (PEP)	PEP Ecopassport
Steel door	Strongdor steel personnel door	EPD (product specific)	EPD Hub

Material	Dataset / Product	Dataset Type	Source
Stone wool insulation	Mineral wool insulation dataset	Generic dataset	OneClick LCA
Thermodynamic water heater	Daikin Altherma M HW (200–260 L)	EPD (PEP Ecopassport)	INIES / PEP
Tile adhesive for ceramics	PCI Verlegemörtel	EPD (product specific)	IBU
Tubular scaffolding structure	Tubular scaffolding system	EPD (product specific)	International EPD System
Radon / damp-proof membrane	Visqueen Radon R400 membrane	EPD (product specific)	EPD Hub
Interior wall paints	Sikkens interior wall paints range	EPD (product specific)	MRPI
Waterproof flexible coating	PCI Lastogum waterproof coating	EPD (product specific)	IBU

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