
Great Places Housing Group

Building Life Cycle Assessment

Laystall Street New Build Apartment Block

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Index

1	Executive Summary	4
2	The Site and Proposed Development	6
2.1	Life Cycle Impact Assessment Result Summary	7
3	Life Cycle Assessment Results and Boundaries	8
3.1	Assessed Impact categories	9
3.2	Analysis Material Scope	10
4	Environmental Data Sources	11
4.1	Project data sources and assumptions	11
5	Detailed assessment results	12
5.1	Results for Global warming potential (GWP), kgCO ₂ eq	12

1 Executive Summary

This Building Life Cycle Assessment has been prepared by Watt Energy & Consulting Engineers Limited on behalf of Great Places Housing Group to support a planning application for the development of a new build apartment block at Laystall Street, Manchester. The report specifically addresses the following Manchester City Council Planning Targets in accordance with The RIBA 2030 Climate Challenge interim date net zero carbon target metrics for the development:

Planning condition 13:

“Prior to commencement of the residential element of the development, an Embodied Carbon Strategy Report shall be submitted to and approved in writing by the City Council as Local Planning Authority. The report shall describe the strategy for the reduction and limiting of embodied carbon and how material circularity will be embedded within the process of design, material sourcing, construction and stewardship/ building management and how this will be monitored as part of the life cycle analysis. The development shall aim for a lifecycle embodied carbon target of 600kgCO₂e/m²(A1-C4) which is in accordance with The RIBA 2030 Climate Challenge interim date net zero carbon target metrics for the development.

Within 6 months of the completion of the development an Embodied Carbon Monitoring Report shall be submitted to the City Council. The report should include as-built embodied carbon life cycle analysis model results, assess the performance of the Embodied Carbon Strategy and include details of constraints, lessons learnt and guidance for future management of the building.”

In relation to the planning documents and policies outlined above, the development is required to achieve an embodied carbon target of **600 kgCO₂e/m²** or less. The purpose of this analysis was to identify potential improvement strategies in order to reduce the whole life carbon emissions of the studied development.

Life Cycle Assessment is a science-based methodology for measuring environmental performance. It's based on international standards and rigorously defined public methodologies for quantifying environmental impacts, expressed in form of potential harm caused by activities to the biosphere, including atmosphere, soil and water bodies. Those impacts are expressed as “equivalent to” normalised units, for example, one kilogram of carbon dioxide in case of global warming potential.

Life Cycle Assessment considers the whole life cycle of the building, including manufacturing, transport, use and final disposal of the resources required for the delivery of the building functions for the whole period which the assessment covers.

Most common impact category covered by LCA is the global warming potential, also referred to as the carbon footprint. It quantifies the impact of greenhouse gases heating the planet. Other common impact categories are ozone depletion, acidification, eutrophication and smog formation. For the purpose of this study in line with planning condition 13 only the GWP was focused on.

In relation to the planning target the proposed development is achieving **595 kgCO₂e/m²**, this surpasses Manchester City Council planning targets and therefore allows compliance to be reached.

2 The Site and Proposed Development

The site is located in the centre of Manchester, towards the north-eastern region of the Northern Quarter and New Islington. A ground floor plan, with the site's extents denoted by the red outline seen in Figure 1 (shown later in this subsection).

The site is bounded to the northwest by Laystall street, Pigeon Street to the southwest and Brock Street to the northeast. The site is currently occupied by an existing Listed three storey office block and parking space.

The proposal is for a new build 8 storey apartment block with lower basement level (use class C2).



Figure 1: Ground floor plan

2.1 Life Cycle Impact Assessment Result Summary

The life cycle assessment was calculated using One Click LCA. The results are summarized in the following table. The results represent the total life cycle impact during 60-year service life.

Impact category	Unit	Results
Global warming potential (greenhouse gases)	kgCO ₂ eq	565

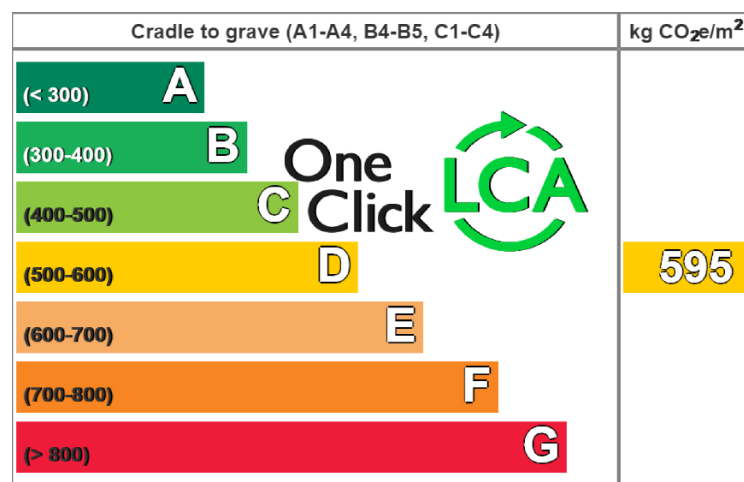


Figure 2: Carbon Heroes Benchmark

3 Life Cycle Assessment Results and Boundaries

In the assessment following life cycle stages according to EN 15804:2012 were included:

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

Description of the life cycle stages, and analysis scope are provided in the table below:

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



	as the impacts from manufacturing the replacing material as well as handling of waste until the end-of-waste state.
B6 Energy use	The considered use phase energy consumption (B6) impacts include exhaust emissions from any building level energy production as well as the environmental impacts of production processes of fuel and externally produced energy. Energy transmission losses are also taken into account.
B7 Water use	The considered use phase water consumption (B7) impacts include the environmental impacts of production processes of fresh water and the impacts from waste water treatment.
C1-C4 Deconstruction	The impacts of deconstruction include impacts for processing recyclable construction waste flows for recycling (C3) until the end-of-waste stage or the impacts of pre-processing and landfilling for waste streams that cannot be recycled (C4) based on type of material. Additionally deconstruction impacts includes emissions caused by waste energy recovery.
D External impacts/end-of-life benefits	The external benefits include emission benefits from recycling recyclable building waste. Benefits for re-used or recycled material types include positive impact of replacing virgin based material with recycled material and benefits for materials that can be recovered for energy cover positive impact for replacing other energy streams based on average impacts of energy production.

3.1 Assessed Impact categories

Building Services Strategy

Impact category	Unit	Description
Global warming potential (greenhouse gases)	kgCO ₂ eq	Describes changes in local, regional, or global surface temperatures caused by an increased concentration of greenhouse gases in the atmosphere. Greenhouse gas emissions from fossil fuel burning has been strongly correlated with two other impact categories: acidification and smog. Often called "carbon footprint".



3.2 Analysis Material Scope

The LCA analysis included following building elements:

Element	Included	Comments
SUPERSTRUCTURE		
Frame	YES	
Upper floors	YES	
Roof	YES	
Stairs	YES	
External Walls	YES	
Windows & External doors	YES	
Internal Walls and Partitions	YES	
Internal Doors	YES	
INTERNAL FINISHES		
Wall Finishes	YES	
Floor Finishes	YES	
Ceiling Finishes	YES	
BUILDING FITTINGS & FURNISHINGS		
Fixed fittings and equipment	NO	
SERVICES		
Sanitary Fittings	NO	
Services Equipment	NO	
Disposal Installations	NO	
Water Installations	NO	
Heat Source	NO	
Space Heating and Air Treatment	NO	
Ventilation Systems	NO	
Electrical Installations	NO	
Gas Installations	NO	
Lift Installations	NO	
Protective Installations, inc. internal CCTV	NO	
Communication Installations	NO	
Specialist Installations	NO	
EXTERNAL WORKS		
Site works	YES	
Drainage	YES	
External services	NO	

4 Environmental Data Sources

One Click LCA EN-15978 tool was used in the assessment. The tool supports CML (2002 - November 2012 or newer) methodology and all assessed impact categories. All of the datasets in the tool follow EN 15804 standard. A complete list of data sources is presented in attachment 1.

4.1 Project data sources and assumptions

The proposed building was calculated in One Click LCA based on design data from Clancy Consulting and OMI Architects:

Area of analysis	Data sources
Material quantities (A1-A3)	<i>Architectural drawings and elemental build ups provided by Eric Wright Group Ltd and OMI Architects</i>
Building material transport distances (A4)	<i>Transport distances were estimated based on typical average transport distances based on material type provided by calculation tool. Steel frame manufacturers Metstructres have provided material specific transport data for all of their products for transport from site to factory.</i>
Construction and installation process (A5)	Calculation tool average construction process emissions based on project size were used in the analysis
Material service life (B1-B5)	Otherwise default values from One Click LCA database were used
Building use phase energy consumption (B6)	Energy consumption was estimated based on design stage energy simulation with project specific use scenarios calculated in SAP12 software
Building use phase energy consumption (B7)	Water consumption was estimated based on typical water consumption for office buildings

5 Detailed assessment results

5.1 Results for Global warming potential (GWP), kgCO₂ eq

Describes changes in local, regional, or global surface temperatures caused by an increased concentration of greenhouse gases in the atmosphere. Greenhouse gas emissions from fossil fuel burning has been strongly correlated with two other impact categories: acidification and smog. Often called “carbon footprint”.

The major contributor for global warming potential GWP emissions was from Raw materials. This is as expected as the construction materials consider the raw material supply; including the extraction and transport to factories, transport impacts; exhaust emissions from supplier to manufacturer and production impacts; considering the manufacturing and waste handling. These processes are very energy intensive which is shown in figure 4 below as materials contributed to 2,870,494 kgCO₂e.

Figure 3: Life Cycle Stages

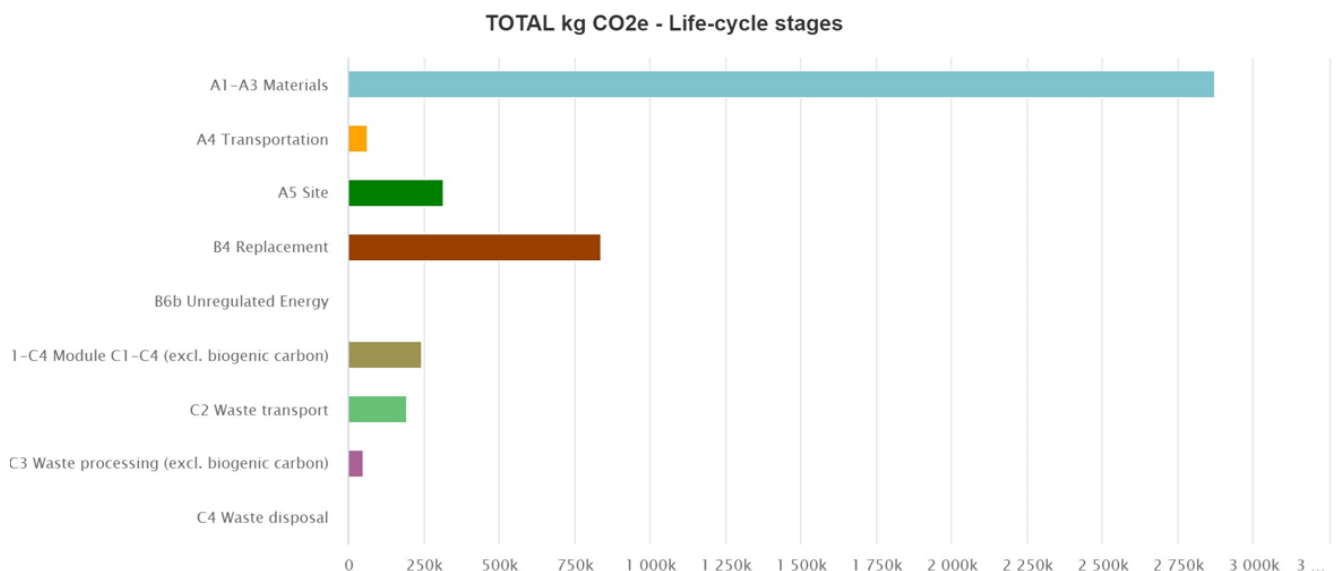


Figure 4: Resource Type

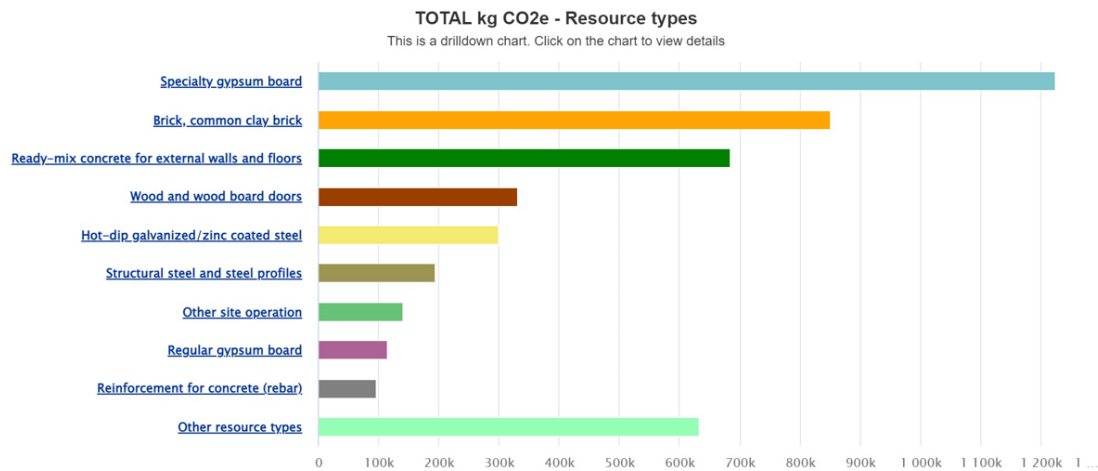


Figure 5: Classifications Total kgCO2e

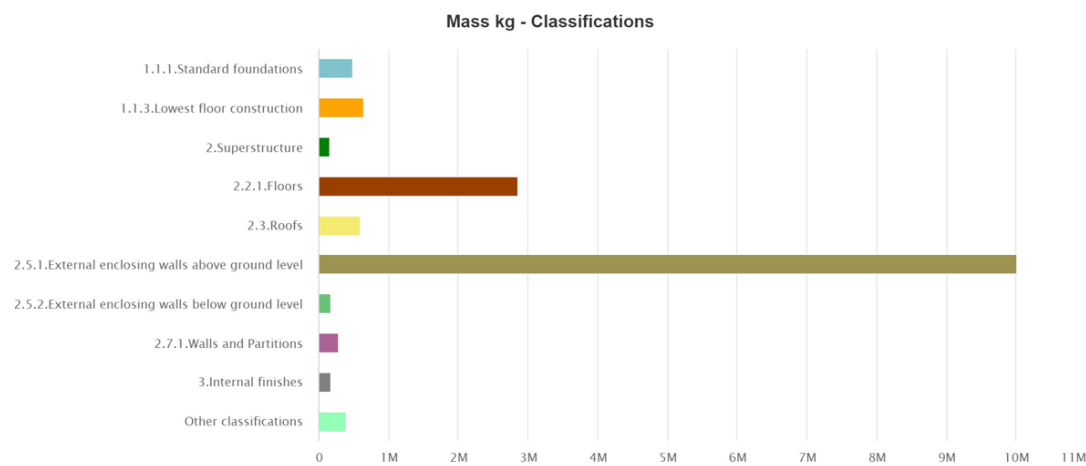


Figure 6: Classifications Mass kg

Results Summary		Global warming kg CO2e
A1-A3	Construction Materials	2,870,494
A4	Transportation to site	60,776
A5	Construction/installation process	315,354
B1-B5	Maintenance and material replacement	835,681
B6	Energy use	207329.9
B7	Water use	
C1-C4	Deconstruction	241,060
D	External impacts (not included in totals)	



