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SUSTAINABILITY

P J Livesey Holdings Ltd
Chorlton Precinct Redevelopment
Manchester

Embodied Carbon Assessment

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EXECUTIVE SUMMARY

The aim of this Embodied Carbon Assessment is to quantify the embodied carbon emissions associated with the residential-led mixed-use redevelopment of the Chorlton Precinct site in Chorlton-Cum-Hardy, Manchester.

The scope of this report covers the life cycle stages included in a whole life carbon assessment as defined in BS15978:2011 Sustainability of Construction Works. The scope includes the extraction, transporting and manufacturing processes associated with the construction products, transport of these elements to Site and construction of dwellings as well as use, maintenance, repair and replacement, deconstruction/demolition, and waste transportation, processing and disposal. It also included operational energy and water.

The embodied carbon emissions associated with the Proposed Development, which have been considered in this assessment, is anticipated to be 42,926,646 $kgCO_2e$ over the 60-year period. Of this, construction will result in a release of 21,975,714 $kgCO_2e$ upfront carbon, with 87.8% of the total upfront carbon being associated with stages A1-A3.

The lifecycle embodied carbon of the Proposed Development is 24,178,440 $kgCO_2e$, which corresponds to an intensity of **561kg CO_2e/m^2**. This is below The Net Zero New Buildings Recommendations for Policy carbon target recommendations for mid-rise residential buildings of 720 $kgCO_2e/m^2$ for 2025 but above 550 $kgCO_2e/m^2$ for 2030 and 375 $kgCO_2e/m^2$ for 2035. Therefore, the lifecycle carbon emissions are in line with current targets for 2025.

In accordance with Manchester City Council's Places for Everyone Joint Development Plan policy JP-S2: Carbon and Energy, the embodied carbon emissions associated with the Proposed Development will be reduced as far as possible. Reduction opportunities have been highlighted, including low carbon, local and durable material selection, use of finishes and performance targets and design for ease of maintenance and disassembly.

CONTENTS

EXECUTIVE SUMMARY III

1. INTRODUCTION 1
   - Carbon Definitions 1
   - Objectives 3
   - Site Setting 3
   - Proposed Development 4
2. POLICY, LEGISLATION AND GUIDANCE 5
   - International Legislation 5
   - National Legislation 5
   - National Policy 6
   - Local Policy 7
   - Guidance 10
3. METHODOLOGY 12
   - Scope of The Assessment 12
   - Building Elements 12
   - Calculating Carbon Emissions 14
   - Data Collection 14
   - Benchmarks 14
   - Assumptions and Limitations 15
4. ASSESSMENT RESULTS 17
   - Embodied Carbon Emissions by Lifecycle Stage 17
   - Target Benchmarking 18
5. REDUCTION OPPORTUNITIES AND RECOMMENDATIONS 21
   - Low Carbon Materials 21
   - Transport of Materials 21
   - Design for Manufacture and Assembly 21
   - Prefabrication and Modular Elements 21
   - Use of Durable Materials 22
   - Finishes and Decorative Façade Elements 22
   - Performance Targets 22
   - Ease of Maintenance 22
   - Design Building Elements for Disassembly 23
6. CONCLUSION 24

FIGURES

Figure 1.1: Whole Life Cycle Carbon Stages and Modules
Figure 4.1: Total kgCO_2e per Module
Figure 4.2: Total kgCO2e per Classification (Building Element)
Figure 4.3: Total kgCO2e per Resource Type
Figure 4.4: Contribution of Building Elements to Carbon Emissions

TABLES

Table 1.1: Embodied Carbon Definitions
Table 2.1: Recommended Carbon Targets for New Buildings
Table 3.1: Building Elements Considered
Table 4.1: Embodied Carbon Emissions by Module

APPENDICES

APPENDIX 1: Site Location Plan
APPENDIX 2: Proposed Site Plan

1. INTRODUCTION

1.1 BWB Consulting Ltd (BWB) was instructed by P J Livesey Holdings Ltd ('the Client') to undertake an assessment of embodied carbon in support of a detailed planning application for the residential-led mixed-use redevelopment ('the Proposed Development') of the Chorlton Precinct site in Chorlton-Cum-Hardy, Manchester ('the Site'). The existing buildings on Site are currently vacant and hoarded off.

1.2 A separate Prior Notice for Demolition application (LPA ref. 141706/DEM/2024) was approved by Manchester City Council (MCC), as the Local Planning Authority, in January 2025, confirming that the proposed demolition of the existing shopping precinct and Graeme House office building can be undertaken under permitted development rights. The approved demolition works (starting with internal soft-strip) are intended to commence in Q2 2025 for a period of circa 20 weeks.

1.3 Every stage of the product's life cycle can have an impact on the environment. An assessment of the 'embodied carbon' of construction materials refers to the total emissions associated with the production, transportation, installation, maintenance, and disposal of a building or infrastructure's materials and components. Unlike operational carbon, which is related to energy used during a building's life (such as heating, cooling, and electricity), embodied carbon is concerned with the carbon footprint of a structure throughout its lifecycle, from raw material extraction to construction, use, and eventual demolition or deconstruction.

1.4 Embodied carbon is a significant factor in the overall carbon emissions of a building, especially as the energy performance of buildings improves and operational carbon decreases. Reducing embodied carbon involves using more sustainable materials, optimising designs, and reusing or recycling existing materials.

Carbon Definitions

1.5 It is important to work to commonly accepted definitions when assessing the carbon emissions associated with the built development.

1.6 sets out these definitions which have been agreed upon by a group of 90 built environment professionals and included in the Royal Institution of Chartered Surveyors (RICS) 'Whole Life Carbon Assessment for the Built Environment' (2nd Edition, Version 3, 2024) guidance document[1].

1.7 The life cycle carbon stages and modules associated with these definitions are shown in **Figure 1.1**.

[1] RICS (2024), 'Whole life carbon assessment for the built environment', Available from: https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment

Table 1.1: Embodied Carbon Definitions

Term	Definition
Whole Life Carbon	Whole life carbon emissions are the sum total of all asset-related GHG emissions and removals, both operational and embodied, over the life cycle of an asset, including its disposal (modules A0–A5, B1–B7, B8 optional, C1–C4, all including biogenic carbon, with A0 assumed to be zero for buildings). Overall whole life carbon asset performance includes separately reporting the potential benefits or loads from future energy or material recovery, reuse, and recycling and from exported utilities (modules D1, D2).
Embodied carbon or life cycle embodied carbon	The embodied carbon emissions of an asset are the total GHG emissions and removals associated with materials and construction processes, throughout the whole life cycle of an asset (modules A0–A5, B1–B5, C1–C4, with A0 assumed to be zero for buildings).
Upfront carbon, buildings	Upfront carbon emissions are GHG emissions associated with materials and construction processes up to practical completion (modules A0–A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion.
Life cycle	The stages a building or other structure undergoes during its lifetime from strategic definition to demolition.
Biogenic carbon	Carbon removals associated with carbon sequestration into biomass, as well as any emissions associated with this sequestered carbon. Biogenic carbon must be reported separately if reporting only upfront carbon, but should be included in the total if reporting embodied carbon or whole life carbon.
Carbon sequestration	The process by which CO_2 is removed from the atmosphere and stored within a material, for example by being stored in biomass as biogenic carbon by plants.

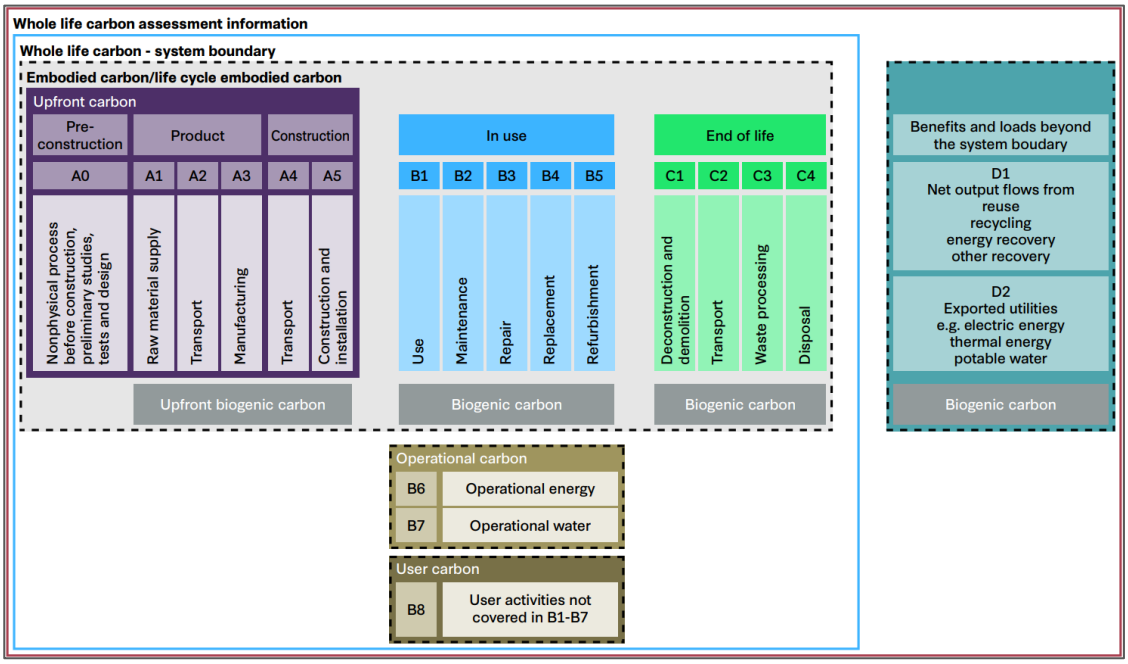


Figure 1.1: Whole Life Cycle Carbon Stages and Modules
Source: RICS - Whole Life Carbon Assessment for the Built Environment (2nd Edition)

Objectives

1.8 The purpose of this assessment is to:

- Demonstrate the Proposed Development's carbon emissions associated with the production, transportation, installation, maintenance, and disposal of the structures' materials and components (i.e. its embodied carbon – as illustrated in **Figure 1.1**.

1.9 The overall aim of this assessment is to highlight carbon emissions relating to construction products to optimise the selection of products with a low embodied carbon at the earliest stages of design and construction of the Proposed Development. This approach is aligned with national and global climate change goals, including the commitment to achieving net zero emissions by mid-century.

1.10 The Net Zero New Buildings Recommendations for Policy carbon target recommendations for mid-rise residential buildings (4 to 20 storeys) for the lifecycle embodied carbon will be utilised as a target to be met for the final design of the Proposed Development. Residential targets are utilised opposed to commercial as the Proposed Development consists of around 97% residential development (by total building area), and the targets for residential development are more stringent, leading to a robust assessment.

Site Setting

1.11 The Site measures 1.27 hectares (ha) is located in the suburb of Chorlton-Cum-Hardy, approximately 4.5km south-west of Manchester city centre. The Site currently consists of

Chorlton Cross Shopping Centre, an office building 'Graeme House' and car park. The Site is hoarded off in advance of permitted demolition although the car park currently remains open for public use.

The surrounding area generally comprises retail, commercial and residential areas, with Chorlton Library and commercial units directly to the north, commercial premises to the east, commercial and retail units to the south and Chorlton Health Centre and residential properties to the west. The Site is encircled by Nicolas Road to the north, Barlow Moor Road (B5217) to the east and Wilbraham Road (A6010) to the south. Manchester Road bisects the Site from north to south. The Site Location Plan can be found in **Appendix 1**.

Proposed Development

1.12 As detailed in the introduction section, demolition of existing buildings has already been approved by MCC (local planning authority). The approved demolition works (starting with internal soft-strip) is proposed to commence in Q2 2025.

1.12 This report forms part of a detailed planning application for a residential led mixed-use redevelopment of the Chorlton Precinct Site comprising:

'The erection of 6no. residential buildings to provide 262 residential dwellings (Use Class C3) with ground floor commercial uses (Use Class E(ae)); infrastructure works including electric substation and associated utilities works, service yard, vehicular pedestrian accesses; together with public realm works and hard/soft landscaping'.

1.13 The Proposed Site Plan can be found in **Appendix 2**.

2. POLICY, LEGISLATION AND GUIDANCE

International Legislation

Paris Agreement

2.1 The Paris Agreement[2] is the first-ever universal, legally binding global climate change agreement, adopted at the Paris climate conference ('COP21') in December 2015. It is an international treaty that aims to limit global warming to well below 2 degrees Celsius (°C) above pre-industrial levels, with an aspiration to limit the increase to 1.5°C.

2.2 Whilst the Paris Agreement does not mandate specific actions on embodied carbon, it provides the global framework and political commitment that influences the actions of individual countries, regions, and industries. The Agreement's overarching climate goals will necessitate significant changes in the construction and infrastructure sectors to reduce embodied carbon.

National Legislation

UK Climate Change Act

2.3 The Climate Change Act 2008[3] established a legal requirement for an 80% reduction in the GHG emissions of the UK economy by 2050 in comparison to a 1990 baseline. The Act also created the Committee on Climate Change, with a responsibility for:

- Setting five-year carbon budgets, covering successive periods of emissions reduction to 2050;
- Advising and scrutinising the UK Government's associated climate change adaptation programmes; and
- Producing a national adaptation plan for the UK Government to implement.

2.4 In 2019, the target was revised to achieve 100% reduction (net zero) GHG emissions by 2050[4].

2.5 In line with the recommendation from the Climate Change Committee, the UK's 'Nationally Determined Contributions (NDC)' or 'sixth Carbon Budget'[5] set a target in law to cut GHG emissions by 78% by 2035. This budget covers the period from 2033 to 2037 and outlines the UK's carbon reduction pathway, setting legally binding limits on total greenhouse gas (GHG) emissions. The sixth Carbon Budget is the first to include specific targets for carbon emissions from the built environment, which has significant implications for embodied carbon.

[2] United Nations Climate Change (2015): The Paris Agreement. Available from: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
[3] HM Government (2008) Climate Change Act 2008. Available at: http://www.legislation.gov.uk/ukpga/2008/27/introduction
[4] The Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Statutory Instrument 2019 No.1056).
[5] UK Government (2021) The Carbon Budget Order 2021. Available at: https://www.legislation.gov.uk/uksi/2021/750/contents/made

National Policy

National Planning Policy Framework

2.6 The Department for Levelling Up, Housing and Communities determines national policies on different aspects of planning and the rules that govern the operation of the system. Accordingly, the National Planning Policy Framework (NPPF)[6], which was most recently updated in December 2024, aims to strengthen local decision making.

2.7 Paragraph 7 states that the purpose of the planning system is to contribute to the achievement of sustainable development, which can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

2.8 Achieving sustainable development requires consideration of, and achieving gains for, each of the three pillars of sustainability: economy; society and the environment. Objectives related to each pillar are set out in Paragraph 8:

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

2.9 Paragraphs 162 – 169 relate to how the planning system should meet the challenge of climate change. Of particular relevance to this report, Paragraph 164 states that "*New development should be planned for in ways that… help to reduce greenhouse gas emissions, such as through its location, orientation and design*".

2.10 Whilst the NPPF does not directly legislate embodied carbon reduction, it lays the groundwork for policies that local planning authorities can adopt to address these issues. The NPPF emphasises sustainable development as a core objective, aiming to reduce carbon emissions and mitigate the effects of climate change. Although the NPPF primarily focuses on operational carbon (energy use during a building's life), the principles of sustainability and the transition to a low-carbon economy can indirectly guide policies that consider embodied carbon in the planning and design of new buildings and infrastructure.

[6] Department for Levelling Up, Housing and Communities (2024), National Planning Policy Framework, available: https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf

Local Policy

Manchester Core Strategy

2.11 The Manchester Core Strategy[7] was adopted by MCC on 11th July 2012. It is the key document in Manchester's Local Development Framework and covers a period of 15 years from 2012 to 2027. It outlines the Council's vision for Manchester in 2027 along with the planning policies which will be used to deliver that vision.

2.12 The policies of relevance to this assessment have been identified as:

2.13 EN4 – Reducing CO_2 Emissions by Enabling Low Carbon Development

"*The Council will seek to reduce […] growth in CO_2 emissions through the following actions*:

- *[…]*
- *The use of building materials with low embodied carbon in new development and refurbishment schemes."*

2.14 EN6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies

"*Applications for residential development of 10 or more units and all other development over 1,000m² [should be accompanied by] an Energy Statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO_2 emissions for all phases of the development."*

Manchester Climate Change Framework 2022

2.15 The Manchester Climate Change Partnership (MCCP) and Manchester Climate Change Agency (MCCA) produced a high-level Climate Change Framework in 2020 for the city to focus action that would help deliver on its climate change ambitions. This Framework was then updated in 2022[8] to include actions required to achieve the city's first milestone of a 50% cut in its direct energy-related emissions. The Framework used a science-based targets approach to set a zero-carbon date of 2038 and a carbon budget of 15 million tonnes of CO_2 for the period 2018-2100 for the city.

2.16 This Framework states the need to "*construct new buildings to high and rising standards of low carbon performance, covering operational and embodied energy, which ensures we do not add to the future cost of decarbonisation*".

2.17 One of the recommended actions within the Framework is for MCC "*to make full use of its existing planning powers, including the Local Plan, to regulate for whole-life carbon emissions standards in all new buildings, covering operational and embodied carbon*".

[7] Manchester City Council (2012), Manchester Local Development Framework: Core Strategy Development Plan Document, available: https://www.manchester.gov.uk/downloads/download/5672/core_strategy
[8] MMCP (2022) 'Manchester Climate Change Framework 2022 Update' Available from: https://democracy.manchester.gov.uk/documents/s35516/2022%20Update%20to%20Manchester%20Climate%20Change%20Framework%2005-09-22.pdf

Net Zero New Buildings Recommendations for Policy

2.18 The MCCP and MCCA produced their Net Zero New Buildings Recommendations for Policy document[9] on December 3rd 2024, which makes planning policy recommendations that include whole life carbon target setting for the design and construction of new buildings with a view to embedding them into MCC's draft Local Plan, which is due out for public consultation in 2025.

2.19 This document has made carbon target recommendations for new buildings based on benchmarking of Manchester-based industry case studies, together with science-based data from best practice guidance across the UK. The targets associated with residential and commercial development is set out in **Table 2.1**. Separate targets have been recommended for mid-rise buildings (4 to 20 storeys), which is the category within which the residential element of the Proposed Development fits into.

2.20 It has also recommended that MCC should produce a standardised reporting template which should be submitted alongside planning applications with fields for all pertinent carbon information about the development to be included.

Table 2.1: Recommended Carbon Targets for New Buildings

Type of development	Scale of development	Lifecycle Embodied Carbon ($kgCO_2e/m^2$)		
		From 2025	From 2030	From 2035
Residential	Low rise (up to 4 storeys)	640	470	300
	Mid rise (4 to 20 storeys)	720	550	375
	High rise (20+ storeys)	800	625	450
Commercial	>1,000 sq. m	970	750	530

[9] Manchester Climate Change Partnership (December, 2024) 'Net Zero New Buildings Recommendations for Policy' Available from: https://www.manchesterclimate.com/news/net-zero-new-buildings-shaping-manchesters-local-plan

Places for Everyone Joint Development Plan Document

2.21 The Manchester Places for Everyone Joint Development Plan Document[10] was adopted on March 20th, 2024. It is a strategic framework aimed at guiding sustainable development across Greater Manchester. It focuses on delivering housing, infrastructure, and environmental enhancements while promoting economic growth and community well-being.

2.22 The following policies of relevance to this assessment have been identified as:

JP-S1: Sustainable Development

> "*To help tackle climate change, development should aim to maximise its economic, social and environmental benefits simultaneously, minimise its adverse impacts, utilise sustainable construction techniques and actively seek opportunities to secure net gains across each of the different objectives…*
>
> *Greater Manchester's Vision is to be at the forefront of action on climate change and to make its fair contribution to international commitments by becoming a carbon neutral city region by 2038. In acknowledgment of climate change, by 2020, all 10 districts and the Greater Manchester Combined Authority have declared a climate emergency. To support this vision a 5 Year Environment Plan was launched in 2019 to identify the urgent actions that are needed to ensure Greater Manchester can follow the required pathway for carbon neutrality.*
>
> *Meeting the 2038 carbon neutrality target will require a radical transformation across a range of sectors to drive carbon reduction. Within this, new development will have a critical role to play and all new homes and commercial/industrial buildings will need to achieve net zero carbon by 2028.The definition of net zero carbon development has been established by the UK Green Building Council. It is expected that development in the Plan area will apply a net zero carbon approach to operational emissions up until 2028, thereafter emissions in construction should be considered. Minimum carbon reduction targets will be set in line with the Future Homes Standard of 80% or until such a time this is superseded*."

JP-S2: Carbon and Energy

> "*The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:*
>
> - *Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;*
> - *An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable:*
>   - *Be net zero carbon, which applies:*

[10] Manchester City Council (2024), Places for Everyone Joint Development Plan Document for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan 2022 to 2039, available: https://www.greatermanchester-ca.gov.uk/what-we-do/planning-and-housing/places-for-everyone/pfe-adoption

- *from adoption – to regulated operational carbon emissions;*
- *from 2028 – to all emissions 'in construction'.*

- *From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions; and*
- *Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy.*

- *From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund.*"

JP-S6: Resource Efficiency

"The achievement of a circular economy and a zero-waste economy will play a key role in meeting Greater Manchester's ambition of becoming a leading green city region by 2038. The following measures will help achieve this:

- *Using sustainable design and construction techniques to reduce carbon emissions, adapt and future proof to the impact of climate change, reduce and recycle waste and minimise water use.*"

Guidance

2.23 The intention of this assessment is not to include all life cycle stages; however, we have drawn upon the best practices of Whole Life Carbon (WLC) assessment. This approach ensures that the assessment adheres to the same underlying principles and rigour as those applied to a full WLC assessment, as defined by RICS.

RICS Professional Statement: Whole Life Carbon Assessment for the Built Environment (2017; updated July 2024)

2.24 The RICS Whole Life Carbon (WLC) Assessment for The Built Environment provides guidance on the implementation of BS EN 15978 and sets out a methodology for evaluating the total carbon emissions associated with a building throughout its life cycle, including its embodied carbon. The specific objectives of this standard are to:

- Provide a consistent and transparent whole life carbon assessment implementation plan and reporting structure for built projects in line with EN 15978;
- Enable coherence in the outputs of whole life carbon assessments to improve the comparability and usability of results;
- Make whole life carbon assessments more 'mainstream' by enhancing their accessibility and therefore encourage greater engagement and uptake by the built environment sector;
- Increase the reliability of whole life carbon assessment by providing a solid source of reference for the industry;
- Promote long-term thinking past project practical completion, concerning the maintenance, durability and adaptability of building components and the project as a whole; and

- Promote circular economic principles by encouraging future repurposing of building components, as well as of the project as a whole, through quantifying their recovery, reuse and/or recycling potential.

2.25 The core principles of undertaking WLC assessments in compliance with this standard are summarised as follows:

- **Consistent WLC measurement**: WLC assessments need to be reliable and comparable;
- **Practical implementation**: This standard emphasises the practical implementation of the existing and widely accepted environmental performance assessment structures;
- **Comprehensive modular structure**: The asset life cycle is broken down into different life cycle stages and modules, and buildings and infrastructure are organised into element categories;
- **Integration of WLC assessments into project design and delivery for more effective carbon management**: For whole life principles to be integrated into design, procurement and construction processes and beyond – and for project teams to be engaged in a timely fashion – WLC assessments should be carried out at key project phases from concept design to project completion;
- **Aligning cost planning and WLC assessments**: Ideally, WLCAs will be undertaken in parallel with life cycle costing within the framework of RICS' New rules of measurement (NRM) or International Cost Management Standard 3;
- **Interaction with carbon management**: The setting of targets, carbon reduction, reporting and leadership should be considered in line with PAS 2080:2023 'Carbon Management in Infrastructure';
- **Integration with tools and building information modelling (BIM)**: The requirements and recommendations provided in this standard can be incorporated into WLC, embodied carbon, operational carbon or life cycle assessment software tools to improve the comparability and usability of WLCA results, and contribute to achieving greater consistency across different assessment tools and software;
- **Assessing, not guessing**: It is important to assess whether proposed options will really achieve reductions in upfront, embodied and whole life carbon for a particular asset; and
- **Carbon cost/benefit**: Assessing WLC is a holistic process where carbon costs and carbon benefits are assessed in relation to each other, in order to optimise overall carbon performance.

2.26 By aligning with RICS guidance, we have ensured that the stages included in this assessment are robustly analysed in accordance with established methodologies. This includes the careful consideration of embodied carbon impacts during the defined project stages, providing a reliable and comprehensive evaluation within the scope of this assessment.

3. METHODOLOGY

3.1 The assessment has been undertaken in line with the best practice environmental performance assessment structure set out in the British Standards Institute's EN 15978:2011 'Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method'[11]. The assessment followed RICS guidance[1], which sets out the mandatory principles and supporting guidance for the consistent interpretation and implementation of WLC assessments.

Scope of The Assessment

3.2 In line with best practice, the following modules (as outlined in **Figure 1.1**) have been considered in this assessment:

- A1–A3 (upfront carbon, product stage): covers the extraction, transportation and manufacturing processes necessary to produce any construction products, including components and MEP (mechanical, electrical and plumbing), required to construct the Proposed Development;
- A4–A5 (upfront carbon, procurement stage): covers the transportation of construction products and all construction processes, including wastage, up to project completion. Module A5 also includes any on-site demolition or strip-out works required at the beginning of the project;
- B1 – B5 (in use stage): covers material-related emissions that occur from use, maintenance, repair and replacement of any construction products, components, or elements of the Proposed Development;
- B6-B7 (operational carbon): covers the carbon emissions associated with the operational energy and water use of the development; and
- C1 – C4 (end of life stage): covers impacts during the end-of-life stage of the Proposed Development. This includes deconstruction or demolition, waste processing, recovery or disposal and associated transport.

3.3 In accordance with RICS guidance[1], A0 is assumed to be 0 $kgCO_2e$.

3.4 Module B1 is assumed to be 0 $kgCO_2e$ as this refers to the operational use of the installed product and key considerations include performance in intended function, user behaviour and appliance efficiency. More information is required on the use stage to calculate this than is currently available.

3.5 Module B5 is also assumed to be 0 $kgCO_2e$ as this refers to refurbishment. It is assumed that the Proposed Development will be built to a standard where refurbishment will not be required during the 60-year life span.

Building Elements

3.6 At this stage of the application, the embodied carbon assessment has been undertaken in accordance with guidance, focusing on the shell and core of the structural design.

[11] British Standards Institute (2011) 'Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method'

The internal fit-out details will be confirmed upon consent and are therefore not included in this assessment.

3.7 This approach is standard for a scheme at this stage and is considered proportionate, ensuring that inaccurate assumptions are not presented where key inputs and parameters are not yet defined. Any gaps in the assessment will be reviewed at later stages, with updated assessments provided as appropriate.

3.8 In line with the RICS guidance[1], the building elements considered for the assessment are set out in **Table 3.1**. The table also sets out whether each element has been included or excluded within the assessment. Any elements excluded is based on a lack of information at the time of undertaking the assessment.

Table 3.1: Building Elements Considered

Element Number	Building Element	Scoped In/Out
0 Demolition		
0.1	Toxic Materials	Scoped Out
0.2	Demolition	Scoped in for end of life
0.3	Supports	Scoped Out
0.4	Groundworks	Scoped Out
0.5	Diversion	Scoped Out
1	Substructure	Scoped In
2 Superstructure		
2.1	Frame	Scoped In
2.2	Upper Floors	Scoped In
2.3	Roof	Scoped Out
2.4	Stairs and Ramps	Scoped In
2.5	External Walls	Scoped In
2.6	Windows and External Doors	Scoped In
2.7	Internal Walls and Partitions	Scoped Out
2.8	Internal Doors	Scoped Out
3	Finishes	Scoped Out
4	Fittings, Furnishings and Equipment (FFE)	Scoped Out
5	Services (MEP)	Partially scoped in – for example external drainage is included but internal MEP services are excluded.
6	Prefabricated Buildings and Building Units	Scoped Out
7	Work to Existing Building	Scoped Out
8	External Works (civil, landscaping etc.)	Scoped In

Calculating Carbon Emissions

3.9 Emissions associated with embodied carbon within construction materials and the end-of-life stage have been assessed using OneClick LCA software (OneClick). OneClick is a widely used, and industry recognised, LCA software designed to calculate and reduce the environmental impacts of construction projects. It enables automated carbon and sustainability assessments by integrating with building information models (BIM), quantity take-offs, and environmental product declarations (EPDs). Key Features include:

- Embodied Carbon Calculation – Assesses materials and construction emissions following RICS, EN 15978, and other LCA standards.
- Regulatory Compliance – Supports UK net zero targets, BREEAM, LEED, and GLA Whole Life-Cycle Carbon assessments.
- Data Integration – Works with BIM, Excel, and databases for streamlined analysis.
- Scenario Analysis – Compares design options to reduce carbon footprint and improve sustainability.
- Reporting & Benchmarking – Generates reports for planning, certification, and corporate sustainability reporting.

3.10 The materials are represented within the model by using each material's associated Environmental Product Declarations (EPDs). EPDs are produced by manufacturers and identify the carbon emissions of their products. By inputting this data into OneClick, the overall carbon emissions can be approximated.

3.11 It should be noted that OneClick has a limited database and, therefore, where a material is not included within its database, a material of similar composition has been selected instead.

Data Collection

3.12 Structural information on building elements to support this report has been provided by 'Civic Engineers', the appointed and certified civil engineer for the Proposed Development, with some omissions outlined below, and, where required, reasonable assumptions have been made for the purpose of the assessment. Information on landscaping has been provided by Randall Thorp.

Benchmarks

3.13 The Net Zero New Buildings Recommendations for Policy carbon target recommendations for mid-rise residential buildings (4 to 20 storeys) for lifecycle embodied carbon have been utilised (**Table 2.1**).

3.14 Therefore, the lifecycle embodied carbon intensity will be benchmarked against the following targets:

- 720 $kgCO_2e/m^2$ from 2025;
- 550 $kgCO_2e/m^2$ from 2030; and
- 375 $kgCO_2e/m^2$ from 2035.

Assumptions and Limitations

3.15 The following assumptions have been made within the assessment:

- The Proposed Development will have a 60-year design life;
- All internal walls are to be timber partitions apart from around stairs cores and lifts, where indicated by the appointed engineer;
- External masonry clay bricks will be used with an internal leaf of steel framing systems;
- PVC double glazed windows will be used;
- C32/40 concrete with 20% GGBS cement replacement will be used;
- All reinforcement is made of 97% recycled content;
- All non-concrete walls are made up from timber studwork;
- No recycled material used from previous demolished buildings will be used;
- Demolition of new buildings after design life based on average value per m^2 of GIA;
- 100mm loadbearing stud walls will be used;
- 80mm thick plasterboard lignin either side of internal Metsec walls will be used;
- 50mm plasterboard lining to external walls will be used;
- There will be masonry support every 2 floors;
- Layout of both cold and hot rolled elements are the same on each level;
- Water drainage and foul water drainage pipework assumed 300mm diameter;
- Adopted combined sewer pipework and channel drains assumed 150mm diameter;
- Paving stones are 100mm thick with 0.3m sub-base;
- Gravel assumed to be 100mm deep;
- Redwood timber assumed for decking; and
- Bitmac substituted to tarmac in OneClick as Bitmac is not available.

3.16 This assessment is limited by the information available at the time of writing. As such, not every material to be used during construction has been included in the assessment. This assessment could be updated as the design of the Proposed Development progresses in order to provide a more wholistic view of the carbon emissions. The following have not been included within the assessment due to a lack of available information/unavailability in OneClick:

- Raised access floor;
- Furniture (i.e. seating and tables), doors, fixtures (i.e. sinks, toilets, showers etc.);
- Lifts;
- Floor finishes;
- Equipment such as water meters and fire alarms;
- Lightweight balconies;
- Any form of services i.e. Mechanical, Electrical, Plumbing etc.;
- Demolition from previous structures due to lack of GIA information;
- Ground floor internal fit out;
- Bedding concrete/sub-base around pipework;
- Resin bound gravelled areas;
- Grass and trees;
- Pergola and climbing plant support structures;
- Railings;
- Outdoor entertainment features and games; and
- Sculptures.

4. ASSESSMENT RESULTS

Embodied Carbon Emissions by Lifecycle Stage

4.1 An estimate of the emissions for the Proposed Development in $kgCO_2e$ over the 60-year period for each of the lifecycle stages relevant to this assessment is summarised in **Table 4.1.**

Table 4.1: Embodied Carbon Emissions by Module

Module	Carbon Emissions ($kgCO_2e$)
A0	0
A1 – A3	19,314,479
A4	524,598
A5	2,136,637
A Life Cycle Stage Total (Upfront Carbon)	21,975,714
B1	0
B2	430,600
B3	107,650
B4	951,463
B5	0
B6 - Regulated	10,721,531
B6 - Unregulated	7,808,966
B7	217,709
B Life Cycle Stage Total	20,237,919
C1	146,404
C2	504,039
C3	220,915
C4	1,867
C Life Cycle Stage Total	873,225
Biogenic Carbon	-160,214
Total	**42,926,646**

4.2 The embodied carbon emissions associated with the Proposed Development, which have been considered in this assessment, is anticipated to be 42,926,646 $kgCO_2e$ over the 60-year period. The construction of the Proposed Development will result in a release of 21,975,714 $kgCO_2e$ upfront carbon, with 87.8% of the total upfront carbon being associated with stages A1-A3.

Target Benchmarking

4.3 The lifecycle embodied carbon of the Proposed Development is 24,178,440 $kgCO_2e$, which corresponds to an intensity of **561kg CO_2e/m^2** based on a GIA of 43,060m^2. This is below The Net Zero New Buildings Recommendations for Policy carbon target recommendations for mid-rise residential buildings of 720 $kgCO_2e/m^2$ for 2025 but above 550 $kgCO_2e/m^2$ for 2030 and 375 $kgCO_2e/m^2$ for 2035. Therefore, the lifecycle carbon emissions are in line with current targets for 2025.

4.4 **Figures 4.1, 4.2 and 4.3** display the total $kgCO_2e$ per life cycle stage, building element and resource type respectively. **Figure 4.4** breaks down the contributions of groups of building elements to the total carbon emissions.

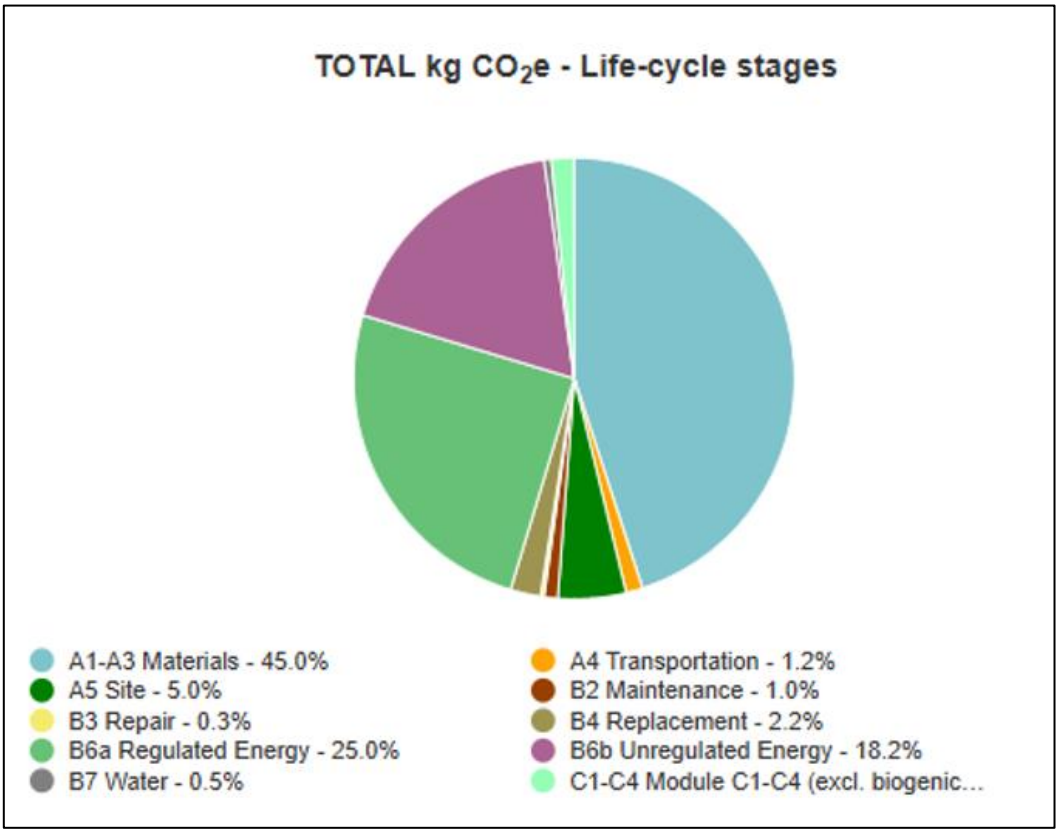


Figure 4.1: Total $kgCO_2e$ per Module

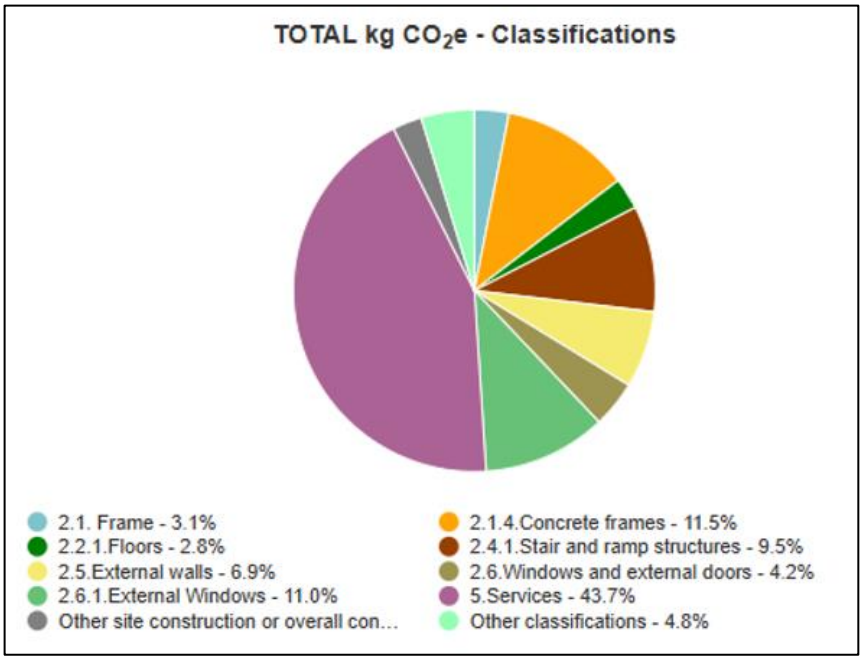


Figure 4.2: Total kgCO2e per Classification (Building Element)

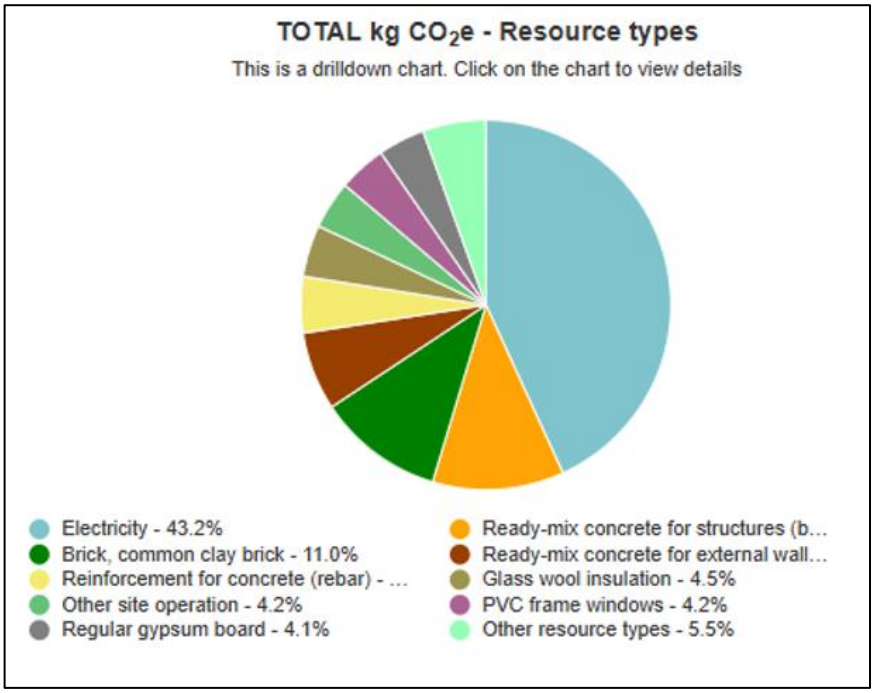


Figure 4.3: Total kgCO2e per Resource Type

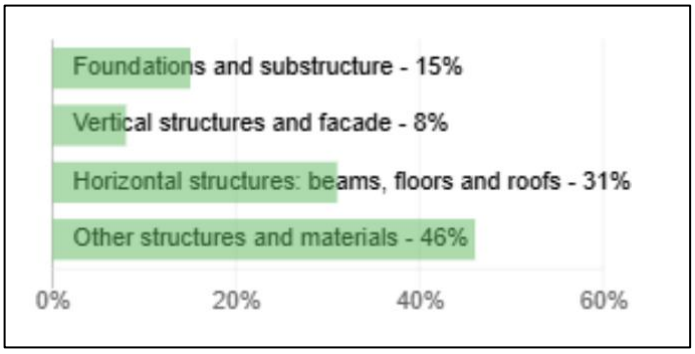


Figure 4.4: Contribution of Building Elements to Carbon Emissions

4.5 **Figures 4.1-4.4** highlight the following:

- Modules A1-A3 account for almost half of all carbon emission considered and operational energy, both regulated and non-regulated, are the next largest contributors;
- The above is reinforced by the fact that services account for almost half of carbon emissions when considering building elements. As MEP are scoped out of the assessment, most of this figure is due to operational energy, which aligns with the large electricity resource type contribution to carbon emissions.

5. REDUCTION OPPORTUNITIES AND RECOMMENDATIONS

5.1 This section presents potential options for further reducing carbon emissions associated with the Proposed Development. This could be achieved by the following measures.

Low Carbon Materials

5.2 By using low carbon materials, the product life cycle emissions of a development can be significantly reduced. This principle can be achieved by using:

- Natural products or those with low energy manufacturing processes. For example, timber or materials with natural fibres come from renewal sources and can be used with low processing, significantly reducing the embodied carbon associated with module A3;
- Materials with recycled content. The impact from raw material extraction is accounted only the first time that material is processed. Afterward, the recycled material includes only the impacts from its reprocessing, reducing module A1 to 0 $kgCO_2e$. This strategy has the added value of keeping the material inside the economy and lowering the pressure for extracting virgin materials; and
- Reuse materials. Similar to using materials with recycled content, reusing materials that still have a service life is another way to reduce new material extraction, and reduce the embodied carbon associated with Module A. The impacts of dismantling those materials and making them fit for reuse can be lower than creating new materials.

Transport of Materials

5.3 Transportation of materials from the manufacturing facility to the Site adds to the embodied carbon associated with the Proposed Development. By buying from local sources, emissions produced during transportation (modules A2 and A4) are reduced and the local economy is supported. These could be further reduced by using electric vehicles.

Design for Manufacture and Assembly

5.4 Design for Manufacture and Assembly (DfMA) is a formal design approach focusing on easy and efficient manufacture and assembly. Implementation of this approach has in impact on embodied carbon by way of reducing waste and emissions during construction works (module A5).

Prefabrication and Modular Elements

5.5 The embodied carbon of a building element includes its material footprint and the waste that was generated during its construction. Prefabrication under controlled conditions allows reduction of waste and its associated carbon emissions. Similarly, modular elements permit the efficient use of materials and facilitate the industrialization/prefabrication of these elements, hence reducing the emissions associated with module A5.

Use of Durable Materials

5.6 Building façade and roofs are under constant wear from natural elements that can lead to frequent repairs and maintenance. By using durable materials, not only is the cost and frequency of refurbishment reduced (module B5) but also reduce the use of material replacement (module B4) and its associated carbon footprint. This also reduces the embodied carbon associated with modules B2 and B3, maintenance and repair.

5.7 The building envelope is critical for the energy performance of buildings and the retrofit of building elements is one of the major strategies in reducing operational energy consumption, therefore also reducing the emissions associated with module B6.

Finishes and Decorative Façade Elements

5.8 Finishes have many purposes, as they can help with the acoustics and thermal conditions inside living spaces. They also have an important aesthetic function, that can translate into our overall wellbeing.

5.9 However, they are amongst the elements that have the shortest lifespans in buildings. For example, internal spaces are reconfigured frequently, eliminating partitions and flooring, and changing the ceiling layout. The aggregated impact of replacing these elements several times during the lifecycle of a building can have a significant overall impact.

5.10 Therefore, finishes should include low-carbon materials as discussed above, and allow for the easy recovery of those materials for recycling or reuse, hence reducing the embodied carbon associated with replacement and refurbishment, modules B4 and B5. Adding finishes to protect materials can also increase their overall impact, for example some varnishes for wood can limit its recyclability and lead to its use as energy source, so these should be used with caution.

Performance Targets

5.11 Setting carbon performance targets to help compare options for materials can help reduce the embodied carbon associated with a development. Whilst the overall goal is finding solutions with lower impacts, these options must perform in a similar fashion to make the comparison valid.

Ease of Maintenance

5.12 Materials used in the building façade need to be serviced and replaced when necessary. This can only be done when the system can easily be taken apart. In this way, designing the Proposed Development for ease of maintenance will lead to a longer life and fewer future emissions, as fewer instances of replacement and refurbishment will be required, reducing the embodied carbon associated with modules B4 and B5. Furthermore, ease of maintenance is likely to result in fewer emissions during maintenance itself, reducing modules B2 and B3.

Design Building Elements for Disassembly

5.13 Where possible, the Proposed Development should be designed to be easily taken apart by sections, or as a whole. This reduces the impact on other elements when extracting the building component and avoids additional wastage. It also allows for more efficient recovery of the materials for disposal, and this makes it easier to preserve the value of the material for future use. This will greatly reduce the emissions associated with life cycle stage C (end of life).

6. CONCLUSION

6.1 The assessment has been undertaken in line with the best practice environmental performance assessment structure set out in the British Standards Institute's EN 15978:2011 'Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method'[11].

6.2 Emissions associated with embodied carbon within construction materials and the end-of-life stage have been assessed using OneClick. Information available at the time of writing has been incorporated, so some assumptions and omissions have been made.

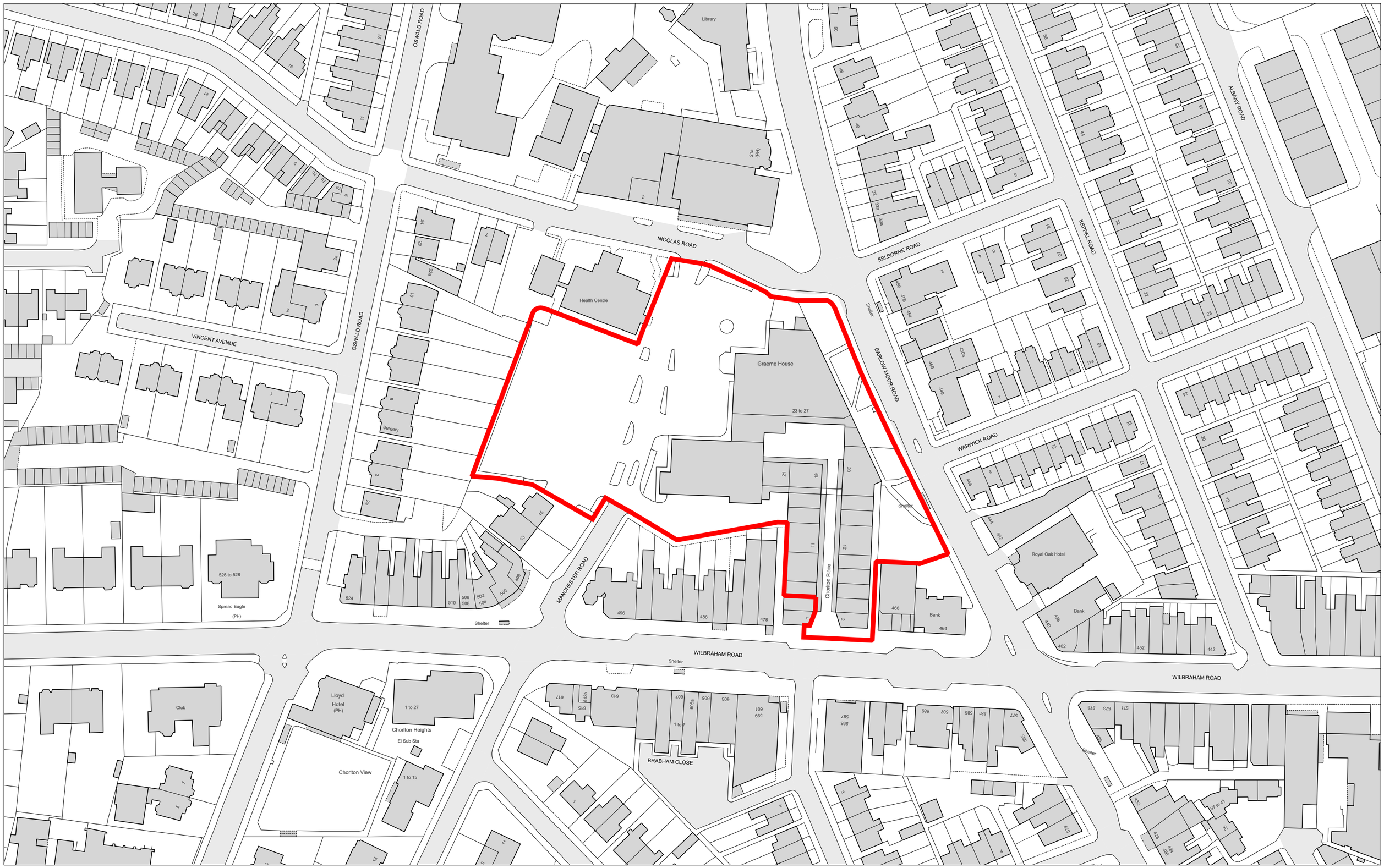
6.3 The embodied carbon emissions associated with the Proposed Development, which have been considered in this assessment, is anticipated to be 42,926,646 $kgCO_2e$ over the 60-year period. The construction of the Proposed Development will result in a release of 21,975,714 $kgCO_2e$ upfront carbon, with 87.8% of the total upfront carbon being associated with stages A1-A3.

6.4 The lifecycle embodied carbon of the Proposed Development is 24,178,440 $kgCO_2e$, which corresponds to an intensity of **561kg CO_2e/m^2**. This is below The Net Zero New Buildings Recommendations for Policy carbon target recommendations for mid-rise residential buildings of 720 $kgCO_2e/m^2$ for 2025 but above 550 $kgCO_2e/m^2$ for 2030 and 375 $kgCO_2e/m^2$ for 2035. Therefore, the lifecycle carbon emissions are in line with current targets for 2025.

6.5 In line with MCC's Places for Everyone Joint Development Plan Document, the embodied carbon emissions associated with the Proposed Development will be reduced as far as possible. Reduction opportunities have been highlighted, including low carbon, local and durable material selection, use of finishes and performance targets and design for ease of maintenance and disassembly.

APPENDICES

APPENDIX 1: Site Location Plan



Amendment	Date
P01 PLANNING ISSUE	12.03.2025

0 10 20 30 40 50m

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Project Name	Job/Drawing No	Amendment
CHORLTON PRECINCT, CHORLTON-CUM-HARDY	2104-FCBS-ZZ-XX-DR-A-0001	P01

Location Plan

Scale 1:1250 @A3
Date 12.03.2025
Drawn SD GROUP
Check AB

Do not scale

Original printed at A3

All dimensions to be checked on site

APPENDIX 2: Proposed Site Plan

Amendment	Date
P01 PLANNING ISSUE	12.03.2025

Notes

This drawing is to be read in conjunction with all other project information by the architect and consultants.

Any drawn reference to existing information contained in this drawing has been created directly from third party survey information. This information is contained and issued in good faith with Feilden Clegg Bradley Studios LLP not held responsible for any inaccuracies identified. The architect is to be notified immediately if any inaccuracies are found.

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Project Name	Job/Drawing No	Amendment
CHORLTON PRECINCT, CHORLTON-CUM-HARDY,	2104-FCBS-ZZ-XX-DR-A-0501	P01
Proposed Site Plan	Scale 1:500@A1 / 1:1000@A3	
	Date 12.03.2025	
	Drawn SD GROUP	
	Check AB	

Do not scale

Original printed at A1

All dimensions to be checked on site

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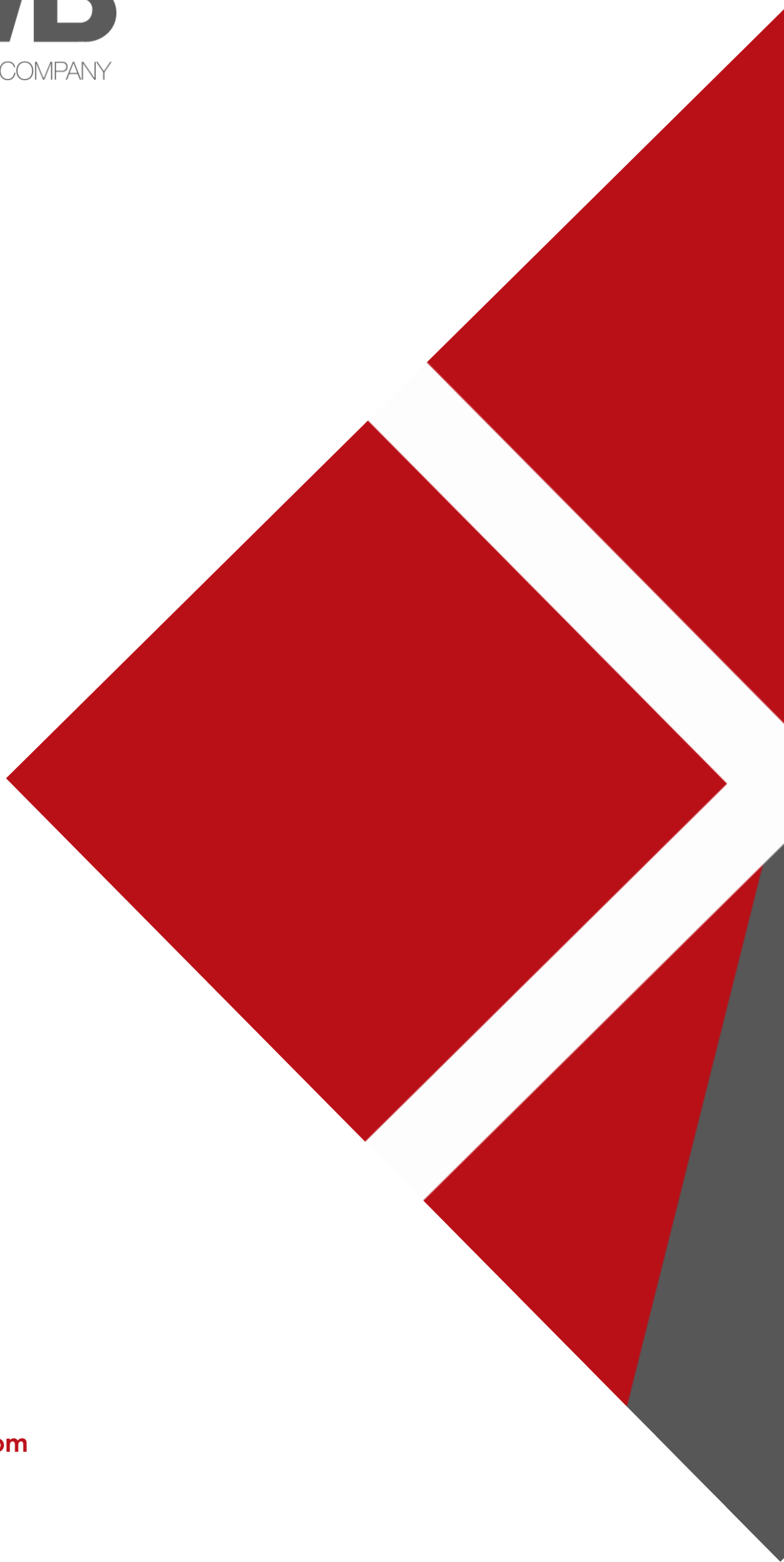

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