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Glenbrook WWS Limited, Maizelands Limited and Arringford Limited | 2-4 Whitworth Street West

Sustainability and Circular Economy Statement

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EXECUTIVE SUMMARY

Glenbrook WWS Limited, Maizelands Limited and Arringford Limited intend to develop a site at 2-4 Whitworth Street West (also referred to as “the development”) in Manchester by constructing a residential tower with amenity space. Mainer Associates have produced a Sustainability and Circular Economy (SCE) Statement to ascertain and set out how the RIBA Stage 2 design, aligns to principles of a circular economy, Net Zero and wider sustainability. Additionally, considerations and possible targets for future Stages will also be discussed.

This report takes place in two stages, a Sustainability Strategy and a Circular Economy Statement. The Sustainability Strategy section of this report aims to establish how the redevelopment of 2-4 Whitworth Street West aligns with the aims and priorities of the ‘Manchester Core Plan, 2012’, the ‘Places for Everyone Joint Development Plan, 2024’ as well as more specifically Manchester City Councils emergency motion on the city’s ambition to become carbon neutral by 2038. This report will set out a set of KPI’s and associated metrics the development should meet in order to achieve the aims of the aforementioned plans.

The Circular Economy Statement has been undertaken to assess the circularity of the development proposal through both qualitative and quantitative analysis. The purpose of this Statement is to set out how the scheme responds to Policy JP-S6 in the Places for Everyone Joint Development Plan, 2024 and how the scheme supports Greater Manchester’s ambition to becoming a leading green city region by 2038. However, this report goes beyond this and aims to set out how the scheme aligns to the six key circular economy principles for the built environment set out in the leading Circular Economy Guidance from the Greater London Authority (GLA), Guidance on Circular Economy Statements (2022). The report intends to demonstrate how the design is resource efficient and maintains products and materials at their highest value for as long as possible.

Section 2.0 discusses and establishes what ‘zero carbon’ means in the context of this development and how circularity can contribute to achieving this. Section 3.1 outlines the Project Teams’ strategic approach to applying building circularity at a strategic level to the development proposals. Decision making on both existing and proposed buildings has been guided by strategic circularity thinking. Section 3.2 introduces the 6 key circular economy principles in the built environment, summarised here, with response to these and how they have been implemented effectively in the proposals detailed in section 3.3.

Circular Economy Principles:

1. Building in layers – ensuring that different parts of the building are accessible for maintenance and replacement where necessary
2. Designing out waste
3. Designing for longevity
4. Designing for adaptability or flexibility
5. Designing for disassembly
6. Using systems, elements or materials that can be reused and recycled.

This Statement also provides a first response to the Circular Economy considerations detailed by the Places for Everyone Joint Development Plan (2024) Policy 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:

1. Development and implementation of the Zero Waste Strategy for Greater Manchester which promotes overall reduction in the level of waste produced and supports resource efficiency within the Plan area in order to gain the maximum value from the things we produce.
2. Recognition of the role of existing infrastructure in managing our waste and protecting such facilities to ensure adequate waste management capacity is maintained; and
3. 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.”

In addition, the Responses on how the Whitworth Street West development scheme aligns to and incorporates the 6 key principles have been guided by the key targets and circular economy objectives on the project.

Key Project Objectives

1. To establish what ‘Zero Carbon’ means for this project.

2. To demonstrate compliance with the relevant local planning policies, thus achieving high sustainability standards and accounting for principles of the circular economy.
3. Set out how the scheme responds to the 6 key principles for building circularity and how they have been effectively implemented within the design.
4. Apply a Building Circularity Indicator tool to offer quantitative analysis on circularity performance, using the WLCA data entry.
5. Detail how the scheme aligns to the Zero Waste Strategy for Greater Manchester.
6. Demonstrate uptake of sustainable design and construction techniques.

To support this commentary, Section 4.0 details quantitative analysis generated using a Building Circularity Indicator Tool. The tool analyses the data on new materials entered within the Whole Life Carbon Assessment also undertaken by Mainer. The tool offers further inference on circularity performance and has calculated a Building Circularity Score for the Whitworth Street West development. The tool determines the circularity of the materials designed into the scheme through assessing extent of reused materials, recycled materials, and raw material. It also calculates the future end-of-life circular handling of these materials assessing whether materials designed into the scheme can be reused, recycled, downcycled or have to be disposed. These factors work together to calculate on overall building circularity percentage score. We have set out some opportunities that would improve this score, for consideration at the next stage.

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Introduction



1.0 INTRODUCTION

Mainer Associates have produced a sustainability and circular economy statement on the RIBA Stage 2 proposals for the redevelopment of the 2-4 Whitworth Street West site. This report has provided a definition of Zero Carbon in the context of this development as well as setting out strategies for how the redevelopment plans to meet this definition. We have also set out the sustainability strategies and metrics that ensure the project meets the national and local planning policies as well as wider sustainability goals. In addition, we have provided commentary on how the proposals goes beyond the policy requirements for Manchester and aligns to the six key strategies on circularity in the built environment as set out by GLA (2020).

We have also detailed numerical analysis derived from data entry involved with Whole Life Carbon Assessment (WLCA) work, within One Click LCA software. The analysis provides a Building Circularity Score for the building, based on the current proposals and the data entry within One Click which the proposals and current concept detail have informed. Detail on how a Building Circularity Score is calculated is provided in the Appendix.

Circular Economy

A Circular Economy is an economic model for sustainable growth and development whereby economic activity is decoupled from the use of finite resources. It is based on three key principles: design, circulate, regenerate.

1. **DESIGN** - Design out & eliminate waste and pollution. Design-in end-of-life strategies for products.
2. **CIRCULATE** - Retain and use products and materials in circulation, at their highest value over their life cycle. In contrast to consuming finite resources or downcycling materials, 'Waste' in the current linear economic model is instead resource in circular economic systems.
3. **REGENERATIVE** - We must ensure economic activity does not degrade nature, but instead support its regeneration.

In the context of development, the London Plan Policy S17 defines a circular economy as:

“One where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste. The end goal is to retain the value of materials and resources indefinitely, with no residual waste at all. This is possible, requiring transformational change in the way that buildings are designed, built, operated, and deconstructed.”

By integrating the three principles into development projects and early proposals we start to design a building for a circular economy. Materials are primarily designed-out where possible, which is coupled with designing-in low impact materials with viable end-of-life strategies such as: re-use, reclamation, or recycling. This is facilitated by ensuring and designing-in ease of disassembly.

The ability to reuse building materials will be increasingly important as the earth's raw materials continue to deplete, and the environmental impact of consuming raw materials accumulates. The process of designing a circular economy moves us away from the linear economic model of; take, make, use, dispose. The classic butterfly diagram overleaf which has become synonymous with discussions on circular economy illustrates the alternative closed-loop economic model.

Circular Economy Butterfly Diagram

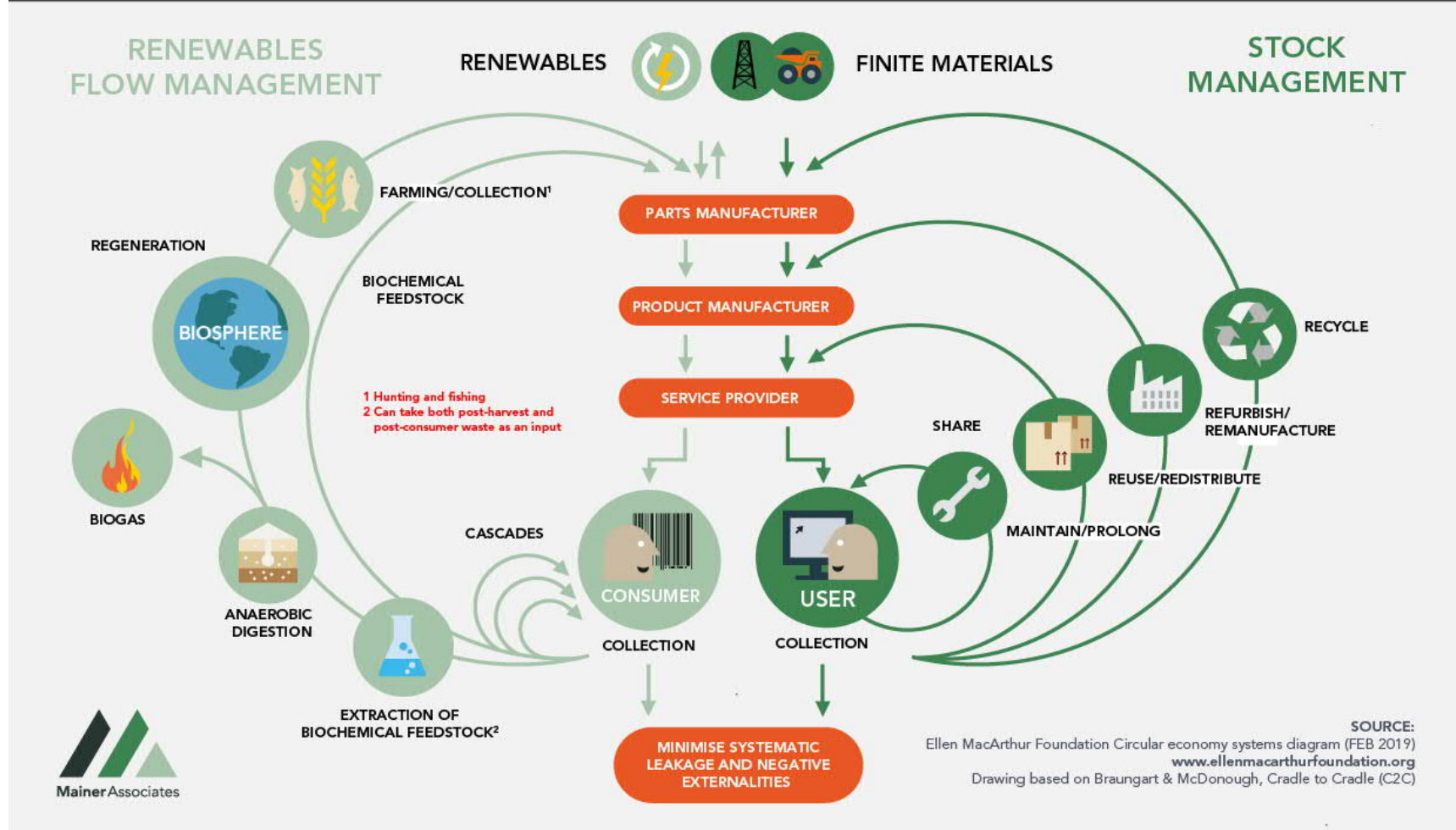


Figure 1: Circular Economy Butterfly Diagram

Purpose

The main purpose of the studies at this early stage is to set out the ways in which the project aims to meet planning sustainability targets and anticipate how the proposals align to the 'design-circulate-regenerate' foundations of a circular economy.

1. To establish what 'Zero Carbon' means for this project.
2. To comply with JP-S6 of the 'Places for Everyone Joint Development Plan, 2024, thus achieving high sustainability standards and accounting for principles of the circular economy.
3. Set out how the scheme responds to the 6 key principles for building circularity and how they have been effectively implemented within the design.
4. Apply a Building Circularity Indicator tool to offer quantitative analysis on circularity performance, using the WLCA data entry.

Additionally, the project team intend to discuss the results and agree a set of opportunities to consider and explore at the next stages of design.

Whitworth Street West Redevelopment

This report covers the sustainability and circular economy aspects of the concept design stage of the development on behalf of the client, Glenbrook. The proposed development involves the redevelopment of both plots 2 and 4 Whitworth Street West into a residential building. This includes the demolition of both 2 & 4 Whitworth Street West buildings and the subsequent construction of a 44-story residential tower with 364 one, two & three bedroom apartments on the 1,054 m² site. The Lower three floors of the development will be dedicated to amenities, while the colonnades will provide a sheltered pedestrian route.

The proposed design consists of Continuous flight auger (CFA) pile foundation system with a stepped back façade and a triple story colonnade supporting above floors. The central structure will consist of a reinforced concrete core frame and sheer walls which will step down in thickness at higher floors. Moreover, the building's exterior will consist of a system of unitised façade panels of glass and terracotta panels on aluminium framing. The colonnades and non-glass façade panels will consist of terracotta cladding panels to ensure consistency with surrounding architecture.

Thermal performance and energy efficiency have been considered and incorporated within the design. This includes a set of performance requirements for the walls, windows and curtain walling and the use of a MVHR ventilation system as well as heat pump systems.

2.0 LOCAL PLANNING POLICIES

2.1 Manchester Core Strategy 2013-2027 (2024)

EC1: Employment and Economic Growth in Manchester

“Development proposals should have regard to:

- Climate change resilience demonstrating how CO2 emissions will be minimised with an aim of zero carbon emissions, through energy efficiency, renewable energy and contributing to low and zero carbon decentralised energy infrastructure;
- Ensuring design makes the best possible use of a site or building in terms of efficient use of space, enhancing the sense of place of the wider area and minimising detrimental impacts on adjacent uses, considers the needs of users/employees of a site/building for access via walking, cycling and public transport and reduction of opportunities for crime by applying current best practice in security design;
- Flood risk through the Manchester- Salford- Trafford Strategic Flood Risk Assessment (SFRA).”

Policy C2: District centres

“Development will support thriving district centres, with distinct local character, providing a good range of accessible key services, including retail, health facilities, public services, leisure activities and financial and legal services. Housing will also be considered an appropriate use within District Centres, providing it supports the vitality and viability of the centre. In delivering this vision provision will be made by 2027 for approximately:

20,000 square metres net convenience retail floorspace

15,000 square metres net comparison retail floorspace

The delivery of this floor space should respect the network of centres across the City and in neighbouring in neighbouring districts. Development within this overall capacity which has the potential to impact on the current or future vitality and viability of other centres in Manchester or other districts will only be acceptable if there is no prospect of the affected centres accommodating growth themselves. The Core Strategy sets a framework for the delivery of the identified capacity. The identification of specific sites, particularly those which require an extension to existing District Centre boundaries, will be addressed through a subsequent Development

Development in District Centres should:

- Prioritise delivery of key 'visitor' services, including retail, public and commercial services and food and drink. The Council will ensure that retail remains the principal use in Primary Shopping Areas, but also ensure that provision is made in District Centres for commercial and service uses, leisure and community facilities and other uses which make a positive contribution to vitality and viability of centres. Subject to impact on overall character and local amenity, the Council will support development which extends the time during which District Centres are active;
- Promote the development of employment which provides opportunities for local people;
- Promote the efficient use of land, particularly through considering options for multi-storey development. New development should positively contribute to the reuse and regeneration of land and premises, together with wider regeneration and investment strategies;
- Contribute positively to the diversity and mix of uses within centres without undermining their primary retail function. Development should also promote a range of retailers and shop formats;
- Promote choice and competition particularly where development will support the independent sector;
- Remedy deficiencies in areas with poor access to facilities.

New development should respect and enhance the character of existing centres.

New development should deliver improvements to the quality and accessibility of the center environment. Opportunities should be taken to adopt sustainable building design and practices to assist in adapting to climate change”

Policy EN4: Reducing CO2 Emissions by Enabling Low and Zero Carbon Development

“Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.

Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.

Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.

The use of building materials with low embodied carbon in new development and refurbishment schemes.”

Policy EN5: Strategic Areas for low and zero carbon decentralised energy infrastructure

“Within Manchester it is considered that the following strategic areas, indicated on the key diagram, will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:

- The Regional Centre, which also includes the Oxford Road Corridor and Eastlands
- District Centres and associated major development sites
- Airport Strategic Site
- Strategic housing location
- Strategic employment locations

Within these areas new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities and other public sector bodies, as appropriate, to bring forward such plans.

Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions.”

Policy 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 1,000 sq m will be expected as a minimum to meet the target unless this can be shown not to be viable. This should be demonstrated through 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 CO2 emissions for all phases of the development....

The energy statement will be required to be submitted at the outset of any proposed development (outline application or before). Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO2 mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.”

Policy EN8: Adaptation to Climate Change

“All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways

- The need to control overheating of buildings through passive design

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO2 mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.”

Policy EN14: Flood Risk

“In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).

In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA.

In CDAs, evidence to justify the surface water run-off approach / rates will be required.

The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.”

Policy PA1: Developer Contributions

“Where needs arise as a result of development, the Council will seek to secure planning obligations in line with Circular 5/2005, Community Infrastructure Levy regulations or successor regulations/guidance. Through such obligations, the Council may seek contributions for the following with priority assessed on a site by site basis:

- Affordable housing
- Education
- Health and wellbeing facilities
- Community facilities
- Provision of Green Infrastructure including open space
- Public realm improvements

- Protection or enhancement of cultural heritage
- Protection or enhancement of environmental value
- Safety and security improvements
- Training and employment initiatives
- Highway improvements, traffic management, sustainable transport and disabled people's access
- Climate change mitigation / adaptation

Where development has a significant impact on the Strategic Road Network developer contributions would be sought through section 278 agreements.

The nature and scale of any planning obligations sought will be related to the form of development and its potential impact upon the surrounding area. Where appropriate, any such provision will be required to be provided on site. Where this is not possible, a commuted sum payment is likely to be sought. In determining the nature and scale of any planning obligation, specific site conditions and other material considerations including viability, redevelopment of previously developed land or mitigation of contamination may be taken into account. The timing of provision of infrastructure and facilities will be carefully considered in order to ensure that appropriate provision is in place before development is occupied.

These issues will be addressed in accordance with guidance in Strategic Regeneration Frameworks and local circumstances.”

2.2 Greater Manchester Combined Authority, Places for Everyone Joint Development Plan (2024)

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.

In preparing plans, authorities should make as much use as possible of suitable previously-developed (brownfield) land and vacant buildings to meet development needs.

In bringing forward previously developed sites for development, particular attention will be paid to tackling land contamination and stability issues, ensuring that appropriate mitigation and remediation is implemented to enable sites to be brought back into use effectively.

Addressing Climate Change

- 5.5. 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 Plan¹⁸ was launched in 2019 to identify the urgent actions that are needed to ensure Greater Manchester can follow the required pathway for carbon neutrality.
- 5.6. To meet our carbon commitments we will need to:
- Be carbon neutral by 2038
 - Hold cumulative carbon dioxide emissions to within our carbon budget
 - Initiate a programme of mitigation to reduce emissions including by:
 - o Significantly upscaling solar photovoltaic energy;
 - o Reducing heat demand in homes;
 - o Moving away from carbon intensive gas as the primary source of heat;
 - o Reducing heating and cooling demand for public and commercial buildings;
 - o Increasing biofuel use;
 - o Enable sustainable choices for travel and decarbonise transport;
 - o Significantly upscaling building retrofit; and
 - o Increase the delivery of nature-based solutions and biodiversity net gain.
- 5.7. In supporting our ambitions, climate change is a key theme running throughout the plan, rather than being reduced to a single policy, and it is only through this combination of actions that it can be properly addressed. In particular we set out:
- Methods to de-carbonise the city region through new and existing development, effective land management and through the provision of infrastructure and new technologies Policy JP-S2 'Carbon and Energy';
 - The delivery of renewable and low carbon energy schemes Policy JP-S3 'Heat and Energy Networks';
 - Water based measures to adapt and reduce the impacts of climate change Policy JP-S4 'Flood Risk and the Water Environment'; and
 - Measures to help achieve a circular and zero-waste economy Policy JPS6 'Resource Efficiency'."

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:

5. Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;
6. Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;
7. Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;
8. Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, treeplanting and natural flood management techniques;
9. An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;
 - a. Be net zero carbon (29) which applies:
 - 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.

Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

- I. Minimise energy demand;
- II. Maximise energy efficiency;
- III. Use renewable energy;
- IV. Use low carbon energy; and
- V. Utilise other energy sources.

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.

As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

- b. Incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site;
- c. Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date;
- d. In residential developments, achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1

For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced.

- e. For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the 'Ene 01 – reduction of energy use and carbon emissions' category rising to 'BREEAM outstanding' equivalent for ENE 01 from 2028.
- f. Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.

Districts may set out specific carbon emission reduction and energy demand targets within Local Plans”

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:

1. Development and implementation of the Zero Waste Strategy for Greater Manchester which promotes overall reduction in the level of waste produced and supports resource efficiency within the Plan area in order to gain the maximum value from the things we produce;
2. Recognition of the role of existing infrastructure in managing our waste and protecting such facilities to ensure adequate waste management capacity is maintained; and

3. 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”

3.0 ZERO CARBON

3.1 Zero Carbon in the Context of this Development

In the context of a construction project in the current status quo, a truly Zero Carbon or Net Zero project is not realistically and practically achievable. This is due to the current energy mix of the electricity grid in the UK. The grid in the UK is still heavily dependent on fossil fuels, meaning all electricity use within a building will have carbon emissions associated with this. As such, the operational carbon emissions of a development once completed will never truly be Net Zero in Operation without significant offsetting despite the significant improvements in operational energy efficiency and movement away from on-site fossil fuel combustion.

In addition, a truly Zero Carbon development is not currently possible due to the Embodied Carbon of the materials and construction techniques currently available. All the materials included in a development will be responsible for a portion of the developments Embodied Carbon and while low Embodied Carbon materials and construction techniques are becoming more readily available, it is not currently possible for a development to be net zero Embodied Carbon without significant offsetting.

Despite Zero Carbon being unachievable in practicality, the development has taken steps towards being as close as feasible to Zero Carbon. These include the following:

1. The Design team has intended to firstly establish and understanding of the initial Embodied Carbon through a Stage 2 Whole Life Carbon Assessment (WLCA), as seen in the climate change chapter of the environmental impact assessment. This acts as a baseline for the exploration and assessment of opportunities to design out and procure out Embodied Carbon through both design and product choices.
2. The commitment to the WLCA process also allows the development to be re-evaluated at later design stage which has a two-fold effect. Firstly, progressing the WLCA sequentially at each stage allows the design team to more accurately estimate the buildings Embodied Carbon at practical completion. Secondly, it can be used to ensure that design and procurement choices have helped reduce Embodied Carbon by numerically quantifying the Embodied Carbon reductions associated with them.
3. Zero carbon thinking has been enshrined in the decision-making process for this development. This is principally evidenced by the façade and structures reports produced by AKT II which contain detailed sustainability sections where the sustainability and Embodied Carbon of materials is considered.

4. The development has been designed to limit the operational carbon emissions. The Energy and Environmental Standards Statement by Futureserv confirms that the buildings ventilation and heating strategies are making improvements upon the energy and operational carbon minimum standards, as shown in Table 2
5. The Energy and Environmental Standards Statement by Futureserv also contains an initial Low/Zero Carbon technology assessment that explores where such technologies could be applied on the development. This shows a commitment to exploring all pathways towards Zero Carbon and is explored further in Section 3.1.
6. Through the WLCA assessment, the development's embodied, and operational carbon emissions have been assessed against sustainable construction guidance. This included benchmarking against the RIBA Climate challenge targets and LETI bands to ensure the development is helping the UK towards its Net Zero compatible pathway. In an effort to be forward thinking with the assessment, the development was compared to the pilot version of the UK Net Zero Carbon Building Standard. This benchmarking exercise confirmed that the early designs of the building are in line with the UK's Net Zero compatible pathway.
7. This report has set out opportunities to improve the building circularity score which where implemented within the design would inherently drive down the schemes Embodied Carbon intensity.

These steps confirm that the design team has, as far as possible, made efforts to ensure the development is as close to Net Zero as is possible in today's construction climate. This means that Zero Carbon in the context of this development means, understanding the developments carbon emissions and then taking all possible steps to reduce both the embodied and operational carbon.

4.0 SUSTAINABILITY AND ZERO CARBON STATEMENT

4.1 Environmental and Zero Carbon Design

Embodied Carbon

Embodied Carbon emissions are made up of all the GHG emissions associated with activities involved in and materials used in the construction, maintenance and eventual deconstruction of the Proposed Development. This includes any emissions associated with the extraction of raw materials to create a product, up until the end of its service life when it will be recycled or sent to landfill. In addition, it includes any works needed to make the site ready for the construction process including the demolition of the existing buildings and other pre-commencement works.

The development has been designed to be sustainable and limit its embodied carbon. Section 5 of this report explores how the embodied carbon of the current design has been limited through dematerialisation, the use of low embodied carbon materials, waste reduction as well as designing the building with adaptability, longevity and end-of-life in mind.

To ensure that the Embodied Carbon of the Proposed Development is in line with the planning requirements, a Stage 2 Whole Life Carbon Assessment (WLCA) was undertaken by Mainer Associates as part of the Climate Change assessment. This was undertaken following the RICS Whole Life Carbon Assessment for the Built Environment 2nd Edition guidance (2024) and utilised Stage 2 materials measurements and specifications provided by the design team to assess the Whole Life Embodied Carbon of the Development.

Due to the early stage of the scheme the data sets and quantities used are primarily model take-offs, which are expectedly commensurate to the design detail developed at Stage 2 and the instructed Building Information Modelling (BIM) requirement on the project. Furthermore, as expected at RIBA Stage 2, the Structural, Architectural and Façade reports infer on materiality and system types with limited inference on exact product specifications. As such, the carbon factors or Environmental Product Declarations (EPDs) applied to the material types and quantities, are generally regionalised and generic datasets.

In addition, the carbon emissions for the demolition of the buildings currently on site have been calculated using estimates. This was calculated in accordance with the RICS v2 professional guidance (2024) using a standard assumption of 35kgCO₂e/m² of demolished area. As the pre-demolition audit has not yet been completed, a demolition area estimate was provided by the design team for use in the WLCA exercise.

Moreover, this assessment was completed based on assumed design specifications and measurements as well as incomplete information. As such, it is not an exact measure of the building's operational carbon. Finally, as is typical for completing WLCA at Stage 2, quantities on Mechanical, Electrical and Plumbing

(MEP) are not currently detailed or measured. In order to address these early uncertainties associated with this early-stage assessment a 15% default carbon contingency factor has been applied to the results of the assessment in accordance with RICS (2024) guidance.

The results of this early-stage carbon assessment, seen in Table 1, confirm that the development's Embodied Carbon (Life cycle stages A1-A5, B2-B5 and C1-C4) is 661.32 kgCO₂e/m². In addition, it can be confirmed that the preliminary designs and Embodied Carbon results are above the RIBA 2030 Climate Challenge 2030 Embodied Carbon target value of <625 kgCO₂e/m².

An initial pilot version of the UK Net Zero Carbon Buildings Standard (UK NZC BS) was released in September 2024, to offer a unified definition for 'Net Zero Carbon Aligned Buildings' in the UK, set out mandatory requirements for net zero aligned buildings, and set outs limits and targets projected up to 2050. This standard sets 'commercial residential upfront carbon benchmarks at 580 kgCO₂e/m² for 2025 and 490 kgCO₂e/m² for 2027. The early-stage carbon assessment, see Table 1, shows that the upfront carbon estimate is 501.04 kgCO₂e/m² which is below the benchmark until 2026.

These results show that the development's current design is making improvements upon the RIBA Climate Challenge Embodied Carbon emission baselines for 2025, meaning it has made steps towards Environmental Design and Life Cycle Assessments as required by MCC Places for Everyone Joint Development Plan policy JP-S1 & JP-S2. However, the current design's Whole Life Embodied Carbon is yet to meet the RIBA Climate Challenge Embodied Carbon emission baselines for 2030.

Opportunities to limit and drive down Embodied Carbon have been detailed in the Climate Change Chapter of the planning report. The mitigation and carbon monitoring measures for adoption into the development in future design stages with the aim of meeting the RIBA 2030 targets. To ensure compliance with policy requirements and the RIBA climate challenge it is the intention to complete further Embodied Carbon assessments sequentially at later stages of the project, when more complete and accurate information is available.

Table 1: Whole life Embodied Carbon emissions associated with each stage of the development		
Life-Cycle-Stages	tCO2e	kgCO2e/m2 (GIA)
Upfront Carbon (A1-A5)	16,481	501.04
In-Use (B2-B5)	4,247	129.12
End-of-life (C1-C4)	1,025	31.15

Embodied Carbon (A1-A5, B1-B5, C1-C4)	21,753	661.32
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Operational Carbon,

The Energy and Environmental Standards Statement produced by Futureserv Ltd contains a preliminary Standard Assessment Procedure (SAP) calculation for the building. The results produced, seen below in Table 2, have been included in the Stage 2 WLCA calculations and contain preliminary Carbon Emission Rates for the development as Designed.

Table 2: Preliminary SAP calculation for the Proposed Development showing results from the SAP calculations compared to targeted rates of the Target Emission Rate, Building Emission Rate, Target Primary Energy Rate and Building Primary Energy Rate (See pg.19 of Futureserv Ltd Energy and Environmental Standards Statement for full results)		
Block Compliance	Result Value	Percentage improvements on requirements (%)
Target Emission Rate (kgCO ₂ /yr/m ²)	13.41	-
Dwelling Emission Rate (kgCO ₂ /yr/m ²)	3.61	73.08%
Target Primary Energy Rate (kWh/m ² /yr)	74.24	-
Dwelling Primary Energy Rate (kWh/m ² /yr)	37.56	49.41%

The results confirm that the development complies with both MCC Places for Everyone Joint Development Plan policy and Building Regulations Part L. The results also show that the current designs are improving upon the Part L requirements by 73.08% for the Dwelling Emission Rate and 49.41% for the Dwelling Primary Energy Rate (See Table 2.0). This is proof that the development has reduced its annual operational carbon emissions of the building below what is required. This will be achieved through application of the Energy Hierarchy; Be Lean, Be Clean, Be Green (as described in section 4.2).

As the above results are based on preliminary calculations, further reporting and assessment of the operational carbon of the Proposed Development at later design stages is required to confirm compliance.

4.2 Energy Efficiency and Renewable Energy

Futureserv Ltd has produced an Energy and Environmental Standards Statement for the 2-4 Whitworth Street West development which demonstrates how the development has made commitments to sustainability through energy efficiency and renewable energy. In addition, it confirms the development's compliance with the Manchester City Council's (MCC) Places for Everyone Joint Development Plan and Building Regulations Part L.

The Energy and Environmental Standards Statement confirms that the development has been designed in line with the Energy Hierarchy, explained as the following:

Be Lean – Demand reduction

- o Passive measures adopted across the building including enhancement of U-Values and air tightness over Part L (2021) values
- o Ensured G-Values are appropriate in reducing heat gains and losses

Be Clean – Maximising energy efficiency

- o Increased hot water generating efficiencies
- o Reduced Standing losses from pipes and cylinders
- o Efficient LED lighting with improved controls
- o Efficient and low energy motors in pumps and fans
- o Efficient heat recovery in relevant systems
- o Combined natural and mechanical heat recovery ventilation systems

Be Green – Renewable Energy

- o Low/zero carbon energy generation in the form of Air Source Heat Pump cylinders to reduce energy demand

This confirms that the Proposed Development is making significant progress towards an energy efficient building design by utilising Be Lean, Be Clean, and Be Green energy hierarchy and the above energy efficiency measures. Furthermore, the Energy and Environmental Standards Statement commits to:

- o Ensure all internal lightings installations making use of low energy technology with timed setbacks and presence/absence detection.

- o Only specify fans, motors and pumps that incorporate Electrical Contractors' Association (ECA) accredited technology and appropriate controls.
- o Providing domestic hot water through air source heat pump cylinders fitted with programmers and room thermostats.
- o Ventilation will be provided via mechanical ventilation heat recovery units with purge ventilation and openable windows fitted as well.

The Energy and Environmental Standards Statement also includes a Low/Zero Carbon (LZC) assessment which assesses the feasibility of different LZC technologies for the project. Moreover, it confirms the viability of Air Source Heat Pumps and Photovoltaic systems as LZC technologies for the development. It also assessed the viability of other LZC technologies but determined they were not feasible for use in this specific development.

4.3 Water Management

Domestic Water Use

The development has targeted eight credits, out of a possible eleven, for the domestic water usage section of the HQM assessment. As such, the development will have to commit to achieving the optional fitting flow rates detailed in Table 3.

Table 3: Optional fitting sanitaryware targeted flowrates	
Optional Fitting	Targeted flow rate
WC's	≤4/2.6 l dual flush
Showers	≤ 8 l/min
Baths	≤ 170 l
Basin Taps	≤ 5 l/min
Kitchen Sink Taps	≤ 6 l/min

Dishwashers	≤1.25 l/place setting
Washing machine & washer-dryer	≤ 8.17 l/kg

By complying with the above targeted flow rate in Table 3.0, the development will have a net modelled water consumption of 110 L/person/day or less. By meeting this water consumption figure, the development will be meeting the water efficiency requirements set out for water efficiency by The Building Regulations, Approved Document G (2010).

4.4 Drainage

AKT II have undertaken a foul and surface water drainage strategy for the development. This included an assessment of the site at current and a review of the proposed drainage design. This included modelling the drainage system and the proposed SuDS strategy to ensure it meets requirements.

The report details the following SuDS measures which are proposed or being investigated for inclusion in the final design:

1. Attenuation Tanks – a 100m³ attenuation tank is proposed to reduce peak discharge rate from the site to the Greenfield Rate.
2. Permeable paving – the use of permeable paving in the hard landscaped areas is being investigated for disposal or water retention.
3. Green or Blue Roof & Rainwater Harvesting – both are being investigated further to determine their practicality on the site.

The current design, which includes the attenuation tank, will be limited to the Q100 greenfield runoff rate of 1.5 litres/second under a 1 in 100 year + 40% storm.

In addition, the AKT II report confirms that the current Drainage Design conforms to national drainage standards and the requirements of the National Planning Policy Framework (NPPF).

4.5 Construction Management

In order to assure that the construction process is managed with environmental and social considerations in mind, a Construction Environmental Management Plan should be created for the project prior to commencement. An exemplary performance under the Considerate Constructors Scheme should also be achieved to ensure that best practice with regards to the public, the workforce and the environment is met.

To reduce the waste produced during the construction phase of the project, the developers have aimed to achieve 4 credits in the Site Waste Management - Construction Resource Efficiency and Diversion of Construction Waste from Landfill section of the Home Quality Mark (HQM) Assessment. Through this they have committed to the production of a Site Waste Management Plan with the following waste limits:

- Less than 8.5 tons of Waste per 100m² of GIA
- Diverting 80% of Construction Waste from landfill
- Diverting 90% of the Demolition Waste from landfill.

Prior to the commencement of works on site, a Pre-Demolition audit should be undertaken as the site currently contains 2 buildings. The Audit will assess the existing material proposed for demolition and set out material pathways in coherence with the waste hierarchy. In turn, the audit will be able to assess

Including a Strategy for the how the circularity in all features of material sourcing, design, construction, and stewardship will be secured and monitored has been established in Section 5 of this Report.

4.6 Biodiversity

The Ecological Appraisal was undertaken by Hilson Moran and assesses the ecological constraints and opportunities for the site. This was done through a baseline desk-based study and a walkover survey. This was then followed by enhancement identification as well as an additional opportunities review of landscaping and architectural proposals.

The baseline study and walkover survey confirm which ecological features are present on or surrounding the site and which features the development may have a significant impact on. The assessment concluded that the site was entirely comprised of developed land with sealed surfaces with no measurable greening i.e., the site was deemed as having low to negligible ecological value.

A range of mitigation measures were identified for implementation throughout the development life including the following:

1. Construction Phase mitigation measures such as:
 - a. Appointing a Biodiversity Champion
 - b. Implementing Appropriate Ecological Training via site induction and toolbox talk process
 - c. Completion and recording of monitoring on site
2. Design Stage mitigation measures such as:
 - a. Consideration of lighting provision

Hilson Moran also reviewed the landscaping proposals and confirms the inclusion of various ecological enhancements.

The Ecological Appraisal also conducted a HQM Ecological Value Calculation based on the information in the report. The results confirm that the pre-development habitat was calculated as having a baseline of zero habitat units. It also confirmed that the development designs yielded a post-construction value of 0.82 habitat units. Due to the baseline being zero, a net gain percentage was not able to be calculated but the improvement on baseline meets trading standards.

Through the described assessment, Hilson Moran identified that 34 of the possible 36 HQM ecological credits (2.1-2.5) are achievable. The progress against these HQM targets can be monitored as the development progresses to ensure that the development meets the national and local planning requirements.

4.7 Adaptation to Climate Change

Through the Climate Change chapter of the planning report, and its associated assessment of Embodied Carbon and Operational Energy, Mainer was able to estimate the development's potential contribution to climate change. The assessment concluded that the current design would have a moderate adverse effect of climate change, meaning that the project's Green House Gas impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.

However, the chapter includes potential recommended mitigation and monitoring methodology for reducing the developments impact on climate change. These include, a carbon target setting and monitoring methodology across the design phases and increasing recycled material content, as well as others. By

implementing the identified mitigation measures, as well as those identified at later design stages, the development will be able to reduce its effect on climate change to Minor Adverse. Moreover, this would mean that the development would be contributing towards the UK’s trajectory towards net zero.

Overheating

As climate change will create increased temperature, it is important to assess how this will affect the potential for overheating within the development. Futureserv Ltd have conducted a CIBSE TM59 Overheating assessment on the development’s early-stage design.

The assessment follows the CIBSE TM59 methodology and analyses compliance using the Manchester weather Centre data, following the building regulation Part O (2021) criteria. Through this, Futureserv Ltd confirmed that the current ventilation strategy of using MVHR system with purge ventilation and openable windows passes the TM59 simulations and part O regulations. As such, this ensures that the flats within the development will not overheat under the current climatic conditions of Manchester.

The TM59 assessment does not take into account future climactic change when analysing overheating. However, Futureserv Ltd have confirmed that the mechanical purge ventilation will be adequate to ensure no overheating will occur under the predicted future climate change scenarios for Manchester.

4.8 Sustainability and Zero Carbon Standards Statement

Table 4 contains qualitative and quantitative targets the development should adhere in order to ensure the development follows the standards set out in each of the sections above. These targets and sections should be reviewed at each design stage, acting as a tracker for the proximity to Zero Carbon and the overall sustainability of the 2-4 Whitworth Street West development.

Table 4: Qualitative and quantitative development sustainability targets			
Section		Target	Metric
Energy Efficiency and Renewable Electricity	Energy Efficiency	Meet and improve on Part L Operational Energy Requirements	>49% improvement on required Dwelling Primary Energy Rate.

	Renewable Energy Generation	Meet or make progress towards Policy JP-S1 Sustainable Development Renewable Energy Generation Targets	Roof mounted Photovoltaic system installed on 40% ground floorspace.
Environmental and Zero Carbon Design	Whole Life Carbon	Continue and complete Whole Life Carbon assessments across Design and Construction Phases	-
	Embodied Carbon	Be in-line with RIBA Climate Challenge 2030 targets for Embodied Carbon.	≤625 kgCO ₂ e/m ²
		Meet and improve upon the UKNZCBS Upfront Carbon Benchmarks for the year of works commencement on site	TBC
	Operational Carbon	Meet and improve on Part L Operational Energy Requirements	>70% improvement on required Dwelling Emission Rate.
		Be in-line with the RIBA Climate Challenge 2030 targets for Operational Energy	≤35 kWh/m ² GIA/yr
		Meet and improve upon the UKNZCBS Operational Energy Benchmarks for the year of works commencement on site	TBC
Water Management	Domestic Water Usage	Meet requirements for 8 credits in HQM assessment	110 L/person/day or less

	Drainage	Meet required runoff rate and ensure the installation of viable SuDS on site.	Achieve Q100 greenfield runoff rate of 1.5 litres/second under a 1 in 100 year + 40% storm.
Construction Management	Ecological management during construction	Adhere with construction phase mitigation measures as detailed in section 3.5 and those recommended in the Ecological Appraisal	-
	Construction Environmental Management Plan	Create and adhere to a Construction Environmental Management Plan prior to commencement	-
		Considerate Constructor scheme	Achieve exemplary performance
	Construction waste management	Produce a Site Waste Management Plan	Achieve 4 credits in the Site Waste Management - Construction Resource Efficiency and Diversion of Construction Waste from Landfill section of the HQM Assessment.
	Demolition waste management	Complete a Pre-demolition audit for both 2 and 4 Whitworth Street	-
Biodiversity	-	Provide significant ecological enhancement to site.	Achieve a yielded a post-construction value of 0.82 habitat units, i.e. a significant net gain in biodiversity for a site with a baseline of zero.
Climate Change Adaptation	Overheating	Ensure designs follow CIBSE TM59 overheating minimum criteria.	All rooms comply with overheating criteria. Maintain ventilation strategies that ensure no overheating with climate change.

5.0 CIRCULAR ECONOMY GOALS AND STRATEGIC APPROACH

With the construction industry cited as contributing 60% of total waste in the UK, there is increasing demand to integrate circular economy design principles into concept designs which are then taken forward into practical implementation during construction.

The focus for considering CE principles in the design have been driven alongside the Whole Life Carbon Assessment also completed at Stage 2. The two analyses help to explore opportunities to reduce, and design-out materials and Embodied Carbon, and set a precedent to ensure this is considered at each RIBA Stage. Ultimately, this ensures that circularity is encompassed in proposals and will encourage sustainable design and procurement activities.

The current circularity score is 31%. The **Building Circularity score** is the average from the Materials Recovered summed up to the Materials Returned. Materials Recovered represents the use of materials in the project from virgin raw materials sources and details the mass shares of virgin, recycled, reused and renewable materials, multiplied by a weighting factor. Materials Returned represents the end-of-life circular handling of materials that are designed into the project. It is the sum of the mass shares of waste undergoing different waste handling methods, multiplied by a weighting factor.

At this early concept stage the team are yet to determine detail on materiality such as recycled content in steel, aluminium, and indicative levels of cement replacement in concrete. Mainer have therefore opted for worst-case data for recycled content when selecting data on these materials, which has notably influenced the materials returned result.

Further detail on how the Building Circularity Score is calculated is detailed in Appendix A.

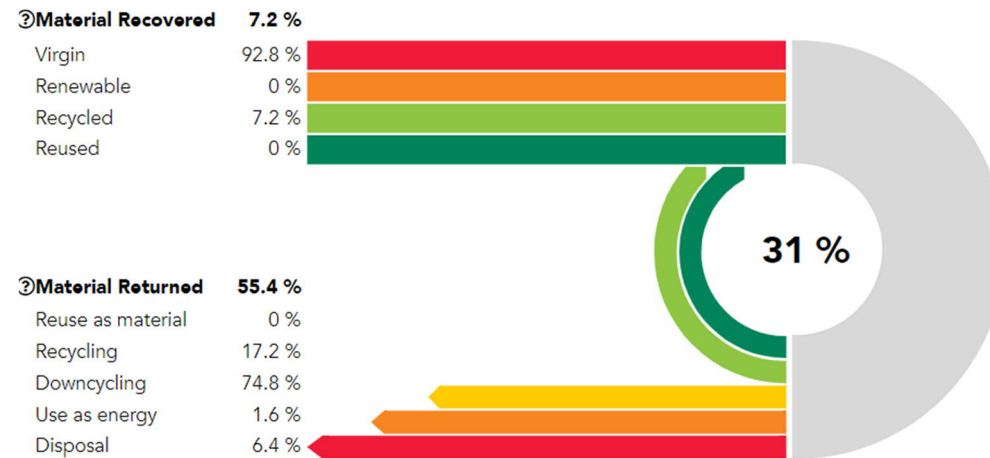


Figure 2 OneClick LCA Building Circularity Score diagram

The percentage of materials recovered (in this case, 7.2%) and their weighting factors is formed as follows:

- 92.8% of Virgin material recovered – Weighting Factor - 0
- 0% of Renewable material recovered – Weighting Factor - 1
- 7.2% of Recycled material recovered - Weighting Factor - 1
- 0% of Reused material recovered - Weighting Factor - 1

The percentage of materials returned (in this case 55.4%) and their weighting factors is formed as follows:

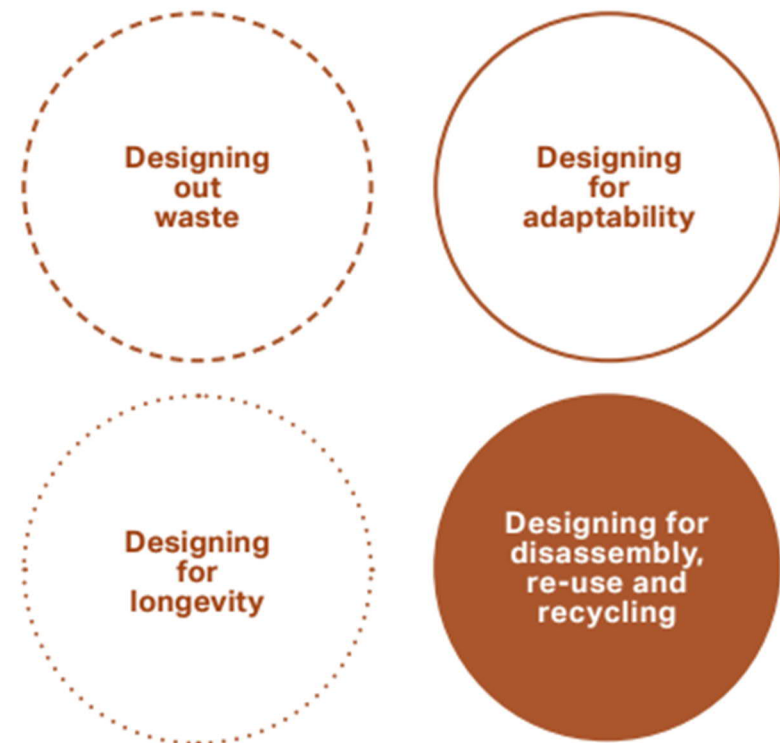
- 0% of Materials reused as materials - Weighting Factor - 1
- 17.2% of Materials recycled - Weighting Factor - 1
- 74.8% of Materials down-cycled - Weighting Factor - 0.5
- 1.6% of Materials used as energy - Weighting Factor - 0.5
- 6.4% of Materials disposed of - Weighting Factor - 0

Based on current data entry informed by design information and concept detail, the designs current circularity score is 27%. Only 1.8% of the materials proposed in the design include for recycled content at this stage as worst-case scenario data selections have been opted for in One Click at this stage. Over 90% of the proposed materials can be recycled or downcycled at building end-of life. Discussion would be needed with Glenbrook to understand their organizational attitudes and strategies towards reuse, and whether they would want to derive further value from the materials as the 60-year life cycle is reached.

This CE statement will document how the proposals currently and could= align to key circular design principles and strategies, summarised here:

1. Dematerialisation - Design out materials.
2. Low impact materials
3. Dematerialisation - Design out waste.
4. Design for adaptability
5. Design for longevity

Design for disassembly, re-use, or reclamation, and finally recycling



5.1 Dematerialisation - Design Out Materials

Analysis at Stage 2 indicates the design has an upfront mass over approx. 42,066 tones and a predicted further 4,048 tones due to replacement over the projects agreed 60-year life span.

The current design could therefore be tested by the team to look at ways to deliver the same design using a lower percentage of mass or material types, through optimization and maximizing resource effectiveness by reducing the mass or material types in the product.

Structure

A key focus of dematerialization is to 'build less' and adapt the existing site and extend existing spaces. A reinforced concrete approach on a multistory residential building illustrates an example of designing-out materials.

The structure has been designed in a regular grid throughout, reducing the need for transfer structures. A smaller column grid also reduces the span of the slabs and subsequently the material requirements. Column sizes will also be stepped down in size through the height of the building, further reducing material quantities. What is more, the piling design have been based on detailed site investigations to minimize the substructure material quantity.

Façade

The current approach to the façade is a unitised curtain walling system featuring anodised aluminium frames with infill panels including Triple Glazed Units Panels (TGU's), openable windows, ventilation louvres, ceramic fritted glazed panels and insulated panels with terracotta over cladding.

The use of unitized curtain walling system reduces material requirements as units can be prefabricated off site and which encourages efficient material use upstream in the supply chain. In addition, the specified unitized design is lightweight and eliminated the need for cover caps with seamless façade interfacing. This reduces the materials required for framing and the structure as well as eliminating the need for capping materials across the whole façade.

5.2 Low Impact Materials

Structure

The Stage 2 WLCA indicates the biggest contributor to the Embodied Carbon results is the proposed structural concrete, contributing 6,801 tCO₂e to the whole life embodied carbon. Use of cement replacement would offer betterment on this. Different levels of cement replacement offer the following reductions in carbon per m³ of concrete when compared to the baseline of 0% replacement.

- 10% Replacement - 23 kgCO₂e/m³
- 20% Replacement - 46 kgCO₂e/m³
- 30% Replacement - 69kgCO₂e/m³

Façade

Across the materials included in the façade, the TGU's and aluminium framing elements are the 5th and 6th most contributing materials to Whole Life Embodied Carbon. The design team could take steps to reduce the impact of the façade as much as possible.

The project team should consider specifying glass, aluminium, and cladding products from manufacturers which have Environmental Product Declarations (EPDs). These are product-level LCAs quantifying the Embodied Carbon of a specification or generic material at defined functional unit. EPDs provide transparency on the Embodied Carbon impacts of the specified systems and will permit comparison of specifications at future design and procurement stages. This may prove particularly useful when considering the final cladding panel specification, as many manufacturers have EPDs specific to their products.

Production of aluminium billets and curtain wall framing for glazing units regularly features scrap aluminium. Minimum levels could be written into work package tenders to challenge the supply chain.

For glazing there is a significant opportunity within the construction sector and commercial glazing industry to shift to a closed-loop recycling for commercial glazing which is currently under explored. Silica sand is a key component in glass production and only occurs in a small number of locations within the UK. Recycled glass cullet can be used in lieu of silica but currently only averages between 20-25% use in European glass manufacturing. Many large glass manufacturers produce panels in Europe, we recommend the tender challenges the eventual Contractor to utilise UK based glass manufacturers where feasible.

The selection of terracotta as the primary cladding material was made due to the materials low Embodied Carbon Emissions as well as its excellent weather resistance and durability. As such, the use of Terracotta for the cladding panels reduces the developments upfront carbon emissions as well as those associated with replacement and maintenance. The design team could make efforts where appropriate to ensure that cladding panels are sourced from local suppliers and producers to further reduce its impact on Embodied Carbon.

Finishes

The vinyl flooring is the third most significant contributor the Whole life Embodied Carbon emission result, resulting in 2,751 tCO₂e. The large area it is applied to, and the short service life play a role in this. However, appraisals could potentially be undertaken at future stages for vinyl flooring with low Embodied Carbon intensities to limit its contribution.

5.3 Design Out Waste

The principle of Designing out Waste should be considered at each RIBA Stage and applied across all building elements. It is one of the key metrics with regards to circularity, concerned with how we can design-out waste during the design process itself, reduce waste on site, and at the buildings end-of-life. Methods to reduce materials and waste during design should guide and aid the selection of materials with clear and viable end-of-life strategies.

Analysis at Stage 2 in the 'Materials Returned' impact category indicates 0% of the materials designed into the scheme have potential for direct reuse. 17.2% is estimated for recycling, and 74.8% for downcycling, with 6.4% allocated for landfill disposal. These figures are influenced by Mainers current approach to data selection, not selecting re-use for any materials as an end-of-life option as this must be discussed with Glenbrook further.

A Glenbrook Materials Database or 'Passport' could be developed for Glenbrook to use as a tool when the 60-year life span is reached. Materials Passports intend to inform building owners on the materials within their build, infer on likely cyclical replacements, and set out possible routes of reuse and recycling strategies for each material at building end-of-life, which would need to be reviewed when the end of the building life cycle nears.

Significant design choices have already been made to design out waste with regard to the façade. The use of unitized façade design allows modular building parts which reduces material excess on-site as units are assembled off-site prior to installation.

Due to the extent of the unitized façade system, thought could be given to connection and fixing methods that would better the ease of future disassembly which would encourage tactful deconstruction methods. Where Glenbrook wants to consider reuse of these elements it is vital they can be deconstructed in a way that maintains good condition, to ensure the products still hold the highest possible value. Both Aluminium framing and insulated panels can be reused where viable options are available, at the time of future demolition.

Other processes to consider when designing and procuring the building materials:

1. Design building elements which can undergo off-site pre-fabrication.
2. Specify and procure products with existing and proven financially viable end-of-life strategies which involve reclamation, repurposing, recycling or downcycling. Materials that can only be landfilled should not be considered.
3. Mandate zero waste to landfill to sub-contractors.
4. Design for deconstruction and disassembly, to permit separation of systems or materials during future demolition.
5. Where specialist systems are designed in, liaise with manufacturers where appropriate, in the design process to limit waste on site.

6. Collation of materials properties digitally into a Material Database or Passport, that when accessed in the future, will provide the information required to increase the likelihood of materials being reused, repurposed or remanufactured at end of use/life.

To reduce the waste produced during the construction phase of the project, the developers have aimed to achieve 4 credits in the Site Waste Management – Construction Resource Efficiency and Diversion of Construction Waste from Landfill section of the Home Quality Mark (HQM) Assessment. Though this they have committed to the production of a Site Waste Management Plan with the following waste limits:

- Less than 8.5 tons of Waste per 100m² of GIA
- Diverting 80% of Construction Waste from landfill
- Diverting 90% of the Demolition Waste from landfill.

Prior to the commencement of works on site, a Pre-Demolition audit should be undertaken as the site currently contains 2 buildings. The Audit will assess the existing material proposed for demolition and set out material pathways in coherence with the waste hierarchy, for example, the reuse and recycling of suitable bricks from the existing buildings into the landscaping designs.

5.4 Design for Adaptability

Due to the layouts and design of the internal walls of the building it can be argued the majority of the projects building GIA can be adapted for future change of use. This is not to say the internal arrangements would not demand significant resources to change the function of each space, more the spatial and technical aspects of building design itself would allow future adaptability.

Structure

The building has been designed with plant rooms located on the lower floors to allow for ease of replacement or future design and technological changes. Aside from the concrete sheer walls, all internal walls are non-load bearing which will allow for future changes in the internal layout where required. Additionally, the Lower floors have been designed for higher loads and as such could withstand alternative uses such as office spaces or retail in future.

Façade

The standardized layout of solid-to-glazed areas of façade will be designed to enhance internal flexibility. The adaptability of the façade system will ensure that the building can be easily adapted to changing use or architectural innovation. The design allows for the façade to shift with occupants' needs and operational functionality, leading to an extended operational life.

'Dry' construction techniques allow ease of construction and future maintenance. Mechanical fastening techniques allow quick and cost-effective disassembly of individual sections.

5.5 Design for Longevity

Structure

The reinforced concrete frame currently proposed is an appropriate option that would offer longevity and last the building life cycle. It is cost effective and will offer structural integrity for the life cycle of the building. The lack of complex maintenance will also aid the longevity of the system.

Façade

The chosen materials for the exposed external elements of the façade have been selected for their ability to withstand environmental stresses. The selected materials are also high quality which along with their weather resilience, offers an enhanced lifespan with reduced need for repair or replacement.

Finishes

The Vinyl flooring specified for the majority of the building contributes 2,751 tCO₂e to the whole life Embodied Carbon, the majority of this is due to replacement of the material. This is evidence that when specifying finishes, it is important to include durability in the context of the building's use and typical replacement factors when specifying floor finishes. Specifying harder wearing flooring systems can limit replacement requirements and reduce the building Embodied Carbon emissions.

5.6 Design for Disassembly and Re-Use or Recyclability (End-of-Life Strategies)

Structure

The reinforced concrete frame core can only be demolished at its end-of-life subject to its permanence. Downcycling by crushing the frame, separating the reinforcement and crushing the concrete into aggregate is the most feasible end of life scenario. However, the building and its frame have a significant serviceable lifespan. As such, future technology or recycling techniques may provide more opportunities for re-use or recycling.

Façade

The unitized façade system has been designed for straightforward replacement and deconstruction. It allows components to be removed with minimal effort, reducing waste upon disassembly. Easy disassembly will naturally encourage separation of the different materials at building end-of-life and therefore increase the likelihood that the materials maintain maximum value and can be reused, recycled or downcycled.

At future stages, the chosen façade sub-contractor could make endeavors to produce a disassembly guide for the client, which can be referenced should replacement or deconstruction be needed. In addition, there should be engagement with the manufacturers to ascertain if any offer 'take-back' schemes whereby they maintain some liability for the product. Ideally, where reuse cannot be sought, facilities which would accept such panels and separate them into components should be identified before the panels are specified to ensure the cladding panels have a viable end-of-life strategy.

Conclusion



6.0 CONCLUSION

Mainer Associates have undertaken a sustainability and circular economy analysis on the RIBA stage 2 proposals for Glenbrook's development of 2-4 Whitworth Street West.

Zero Carbon

Currently, a truly Zero Carbon Construction Project is not realistically and practically achievable. This is due to the current make-up of the UK's electrical grid and the Embodied Carbon in all construction materials which means that to limit or completely offset the emissions would be take significant effort. Despite Zero Carbon being unachievable in practicality, the development has taken steps towards being as close as feasible to Zero Carbon. Including but not limited to, limiting the developments Whole Life Embodied Carbon and Operational Energy to be within a UK Net Zero Compatible Pathway, embedding carbon considerations in procurement decision making and implementing circular economy principles within the development to drive down embodied carbon,

These steps confirm that the design team has made efforts to ensure the development is as close to Net Zero as is possible in today's construction climate. As such, Zero Carbon in the context of this development means efforts are made to understand the developments carbon emissions and all avenues are explored to reduce it inline a UK Net Zero Compatible Pathway.

Sustainability and Zero Carbon Statement

This report provides an examination of the current sustainability and Zero Carbon considerations of the proposed development. Within this statement, Mainer examines the current steps taken by the design team which engender a move towards a Zero Carbon project and wider sustainability goals. Through the assessment of reports and information provided by the design team in area such as energy efficiency, low carbon design, biodiversity, etc., Mainer has collected a set of targets.

The established quantitative and qualitative targets that form a set of measurements that can be used to ensure that the development adheres to regulation and takes steps towards being sustainable and within this report's definition of Zero Carbon. These targets and sections should be reviewed at each design stage, acting as a tracker for the proximity to Zero Carbon and the overall sustainability of the 2-4 Whitworth Street West development.

Circular Economy

We have provided commentary on how the proposals align to 6 key strategies on circularity in the built environment. We have also detailed numerical analysis derived from data entry involved with Whole Life Carbon Assessment (WLCA) work, within One Click LCA software. The analysis provides a Building Circularity Score for the building, based on the current proposals and the data entry within One Click which the proposals and current concept detail have informed.

The current proposal achieves a building circularity score of 31%. In summary, this figure provides comment on the designs draw on natural resources versus use of recycled content, although this is currently influenced by Concept design detail. The result also infers on the percentages of proposed materials allocated for reuse, or those that could be recycled and downcycled.

The main purpose of the study at this early stage and therefore been to:

1. Provide qualitative responses to key strategies for building circularity and how they can be implemented effectively.
2. Provide quantitative analysis based on WLCA data entry is also provided to provide inference on circularity performance.
3. Additionally, the project team intend to discuss the results and agree a set of opportunities to consider and explore at the next stages of design development.

We have set out several recommendations and possible targets within this report informed by results at this stage. We are now at a critical stage whereby the design team need to decide to what extent these analyses are going to inform design and decision making. The project does not have any agreed performance targets on circularity, the value and purpose of these analyses would therefore benefit from Mainer and the design team agreeing a set of targets and monitoring performance and achievement of these through the next stages and through to completion.

Appendices



APPENDIX A: BUILDING CIRCULARITY CALCULATION

- Weighting the percentages of "materials recovered"

The percentages for each of the categories - (except the virgin materials, because it has a weighting factor of 0) are summed up ($0\% + 7.2\% + 0\%$) = 7.2%

- Weighting the percentages of "materials recovered"

The same logic as above is applied. The weightings of each category correspond to its multiplication factor

Materials reused as material: weighting factor = 1 -> $0\% * 1 = 0\%$

Recycling: weighting factor = 1 -> $1.72\% * 1 = 1.72\%$

Downcycling: weighting factor = 0.5 -> $74.8\% * 0.5 = 37.4\%$

Use as energy: weighting factor = 0.5 -> $1.6\% * 0.5 = 0.8\%$

Disposal: weighting factor = 0

$1.72\% + 37.4\% + 0.8\% = 39.92\%$

- Reaching the total average

$7.2\% + 39.92\% = 47.12\%$

$47.12\% / 2 = 23.56\%$

23.56% is rounded to 24%.

