



Manchester Port Street Ltd

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# Port Street – Circular Economy Statement

Final Report



Computer-generated image of the proposed Port Street development produced by SimpsonHaugh Architects

July 2023

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## Report for

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## Document revisions

| No.          | Details            | Date       |
|--------------|--------------------|------------|
| <b>Draft</b> | Initial for review | 03/05/2023 |
| <b>1.0</b>   | Final Report       | 25/05/2023 |
| <b>2.0</b>   | Updated Report     | 03/07/2023 |
| <b>3.0</b>   | Amendments         | 11/07/2023 |
| <b>4.0</b>   | Amendments         | 07/08/2023 |

# Executive summary

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## Introduction (Section 1)

This Circular Economy Statement (CES) has been produced for the purpose of demonstrating how the principles of a closed loop resource management system, the elimination of waste and pollution, and environmental regeneration have been considered, and adopted, across the design, construction, operation and future dismantling / deconstruction of the Port Street development (hereafter 'the Proposed Development').

This strategy has been prepared at Royal Institute of British Architects (RIBA) Stage 4, and therefore outlines the principles, targets and actions that have been identified for adoption across the design, construction and operation of the development.

## Development Description (Section 2)

The development comprises a 'ground plus 32-storey' residential tower with a podium level. The tower contains residential units, residential amenity spaces, as well as commercial uses and underground car parking.

The Proposed Development comprises an area 0.48 hectares. During the design process, the architecture underwent a series of revisions and refinements in response to feedback from Manchester City Council (MCC), statutory and non-statutory consultees and other stakeholders. In most cases, recent design moves have been adopted with the aim of delivering a solution that more comprehensively addressed the concerns and requirements of the local community.

## Circular Design Method Statement (Section 3)

In accordance with the scale and nature of the tower, proportionate circular economy principles have been incorporated into building design processes, across the lifecycle of the development to ensure that:

- material resources are managed sustainably;
- waste and pollution are minimised; and
- the natural environment is practicably preserved and regenerated.

Adopting these principles helps reduce direct (local) and indirect (wider) environmental impacts, and has the potential to afford a range of lifetime economic benefits. The design stage has considered principles such as building in layers, designing for longevity, adaptability and replaceability, and promoting component and material reuse. In this, the design has followed an approach that considers how each layer of the building has its own lifecycle and (hence) circular economy approach.

By considering the varied lifetimes of building components, the building can be optimally adapted to future different functions and layouts, promoting the principles of Design for Disassembly and circular economy goals.

## Circular Economy Strategy (Section 4)

The circular economy principles, and overarching commitments that were adopted on the Proposed Development, are presented in Section 3 and summarised in **Table 0.1**. The principles reflect the Greater London Authority guidance (GLA guidance), and address the principles set out in Table 6.22 and Table 6.23 of the Environmental Statement<sup>1</sup>.

**Table 0.1 Circular economy principles and commitments<sup>2</sup>**

| Principle                                                             | Commitments                                                                                                                                       |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Conserve resources, increase efficiency and source sustainably</b> | Minimise the quantities of materials used                                                                                                         |
|                                                                       | Minimise the quantities of other resources used (e.g., technological assets)                                                                      |
|                                                                       | Specify and source materials and other resources responsibly and sustainably (including through the use of locally sourced and recycled material) |
|                                                                       | Reuse of components and materials with minimal processing                                                                                         |
|                                                                       | Material selection based on life expectancy of the building and embodied resource demands and/or maintenance requirements.                        |
|                                                                       | Efficient fabrication through the use of modern methods of construction (e.g., modular systems, precision manufacturing etc.)                     |
|                                                                       | Use of lightweight materials                                                                                                                      |
| <b>Design to eliminate waste (and for ease of maintenance)</b>        | Design for longevity and durability                                                                                                               |
|                                                                       | Designing for adaptability and flexibility                                                                                                        |
|                                                                       | Designing for replaceability or disassembly                                                                                                       |
|                                                                       | Design out construction, demolition, excavation and municipal waste arising                                                                       |
|                                                                       | Design building shape and form for efficient material use during construction and operation                                                       |
| <b>Manage waste sustainably and at the highest value</b>              | Manage/minimise demolition and excavation waste                                                                                                   |
|                                                                       | Manage/minimise construction waste                                                                                                                |
|                                                                       | Manage/minimise municipal waste (and industrial waste) during operation, if applicable)                                                           |
|                                                                       | Minimise operational water use and other 'peripheral' materials <sup>3</sup> during construction                                                  |
| <b>Preserving and regenerating the natural environment</b>            | Use of materials that can be returned to natural nutrient cycles once their function has been fulfilled.                                          |
|                                                                       | Use of carbon-absorbing materials                                                                                                                 |

<sup>1</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

<sup>2</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

<sup>3</sup> Peripheral materials include materials that are used during design/ construction but are not incorporated within the structure – this could include water use, plastic sheeting and machinery etc.

## Sourcing and specification (Section 5)

This section provides a summary of information on the key materials to be specified and used on the Proposed Development; it provides further evidence of how resource efficiency and circular economy principles have been implemented.

In this, Manchester Port Street Ltd has engaged early with its design team, delivery partners and contractors to refine the sustainability strategy for delivery, and – as a result - targets for materials to be specific have been set (**Table 0.2**). The current strategy and accompanying targets will be reviewed and updated as the design evolves.

**Table 0.2 Targets set for key materials<sup>4</sup>**

| Material | Type      | Targets and specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Concrete | Cement    | <p>Concrete will be specified to be sourced in accordance with BES 6001-Framework Standard for Responsible Sourcing - level “very good” or equivalent.</p> <p>Use of Ground Granulated Blast-furnace Slag (GGBS) - in place of Portland cement - will be encouraged where available. For example, Manchester Port Street Ltd will aspire to use high GGBS mixes in the large ground pours such as the cap foundation for the tower (500m<sup>3</sup> at 60% GGBS). Manchester Port Street Ltd will also aspire to use 20-30% GGBS for other elements where possible and where high GGBS is available, as this is determined using summer or winter mixes; there are therefore two mixes shown for these elements, some mixes with 20-30% and some with 0%, to reflect the summer and winter mixes. Appendix B details the percentages of GGBS per building element.</p> <p>Provision of data on the embodied carbon of all concrete mixes (in accordance with BS EN 15978:2011 Sustainability of construction works) will be required of suppliers, as part of procurement good practice.</p> |
|          | Aggregate | Recycled aggregates will be used where applicable and where permitted, in accordance with the Structural Specification for the Proposed Development.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Masonry  | Masonry   | <p>Masonry will be specified to be sourced in accordance with BES 6001-Framework Standard for Responsible Sourcing - level “good” or equivalent. The materials on the Proposed Development achieve the following grades:</p> <ul style="list-style-type: none"> <li>• Facing Bricks – MichelMersch Porcelain White Brick– compliant with BES 6001 Very Good Rating</li> <li>• Coloured Mortars – Tarmac Mortars – compliant with BES 6001 Excellent Rating</li> <li>• Facing Bricks – Crest Buckingham Multi – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement</li> <li>• Masonry Support – IG/ Keystone Group – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement, and are seeking BES 6001 accreditation during 2024.</li> </ul>                                                                                                                                                                                          |

<sup>4</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

| Material | Type              | Targets and specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Steel    | Reinforcing steel | <p>Reinforcing steel will be specified to be sourced in accordance with BES 6001- Framework Standard for Responsible Sourcing - level “good”, or equivalent.</p> <p>Reinforcing steel that is used across this proposed development will contain 90-95% recycled steel material, insofar as possible; any steel sourced from Electric Arc Furnace processes will comprise 100% recycled steel content. The volume and proportion of these elements, as a percentage of all steel used, can be calculated as the design evolves.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Structural steel  | <p>The specification for the Proposed Development states that 100% of structural steel should, where possible, be sourced from either a BES 6001- Framework Standard for Responsible Sourcing - or an EMS certified supplier to a certification standard of “very good” with a minimum content from ResponsibleSteel™ Certified Steel (or equivalent) or Low Embodied Carbon Steel. Whilst our Steel Frame System (SFS) Manufacturer do not hold BES 6001 certification, Environmental Product Declarations will be provided.</p> <p>Grade S355 steel will generally be adopted in the design and in accordance with the following technical delivery requirements unless otherwise specified:</p> <ul style="list-style-type: none"> <li>• BS EN 10 025 Hot rolled products of structural steels - Technical delivery conditions for non-alloy structural steels (Parts 2 to 6)</li> <li>• BS EN 10210-1 Hot finished structural hollow sections of non-alloy and fine grain steels; and</li> <li>• BS EN 10219-1 Cold formed welded structural hollow sections of non-alloy and fine grain steels).</li> </ul> <p>The project specification states that 100% of structural steel will be sourced from a BES6001 Framework Standard for Responsible Sourcing or Environmental Management System (EMS) certified supplier to a certification standard of “very good” with a minimum content from ResponsibleSteel™ Certified Steel (or equivalent) or Low Embodied Carbon Steel.</p> |
| Timber   | Timber            | <p>100% of timber used for formwork will be responsibly sourced and obtained from well managed forests/ plantations in accordance with the laws governing forest management. Documentary evidence will be supplied as part of procurement practice.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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# 1. Introduction

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## 1.1 Overview

WSP has been commissioned to develop a CES, on behalf of Manchester Port Street Ltd, with consideration to the Proposed Development (as described in Section 2).

The scope of this strategy comprises a Circular Economy Statement at RIBA Stage 4, which is to be submitted as per requirements of condition 4b attached to planning permission 132489/FO/2021.

The CES has been prepared in line with guidance set out in the London Plan (March 2022) Policy D3 'Optimising Site Capacity Through the Design-led Approach' and Policy SI 7 'Reducing Waste and Supporting the Circular Economy'.

This Strategy has been prepared at RIBA Stage 4 and outlines the principles, targets and actions that have been identified for adoption across the evolution of the design from outline stage, across the remainder of the lifecycle of the development.

It is expected that to refine and finalise this strategy, an augmented CES will be prepared during the post-Construction stage, approximately 12 months after the completion of the development (RIBA 5/6) to outline how the principles explored in this statement have been implemented within the building in operation.

## 1.2 Statement Purpose and Structure

The purpose of this statement is to demonstrate how the development has and will continue to incorporate circular economy measures through design and construction activities, into the lifecycle of the assets and its componentry.

This strategy is in alignment with principles and policies on circular economy as set out by various organisations such as the GLA, the Waste and Resources Action Programme (WRAP). The structure of this strategy is as follows:

- **Section 2 - Development description:** the Proposed Development location, description, context within local planning and key design choices and evolution.
- **Section 3 - Circular design method statement:** outlines the relevant circular economy policy context, and key definitions and design principles that have been considered to adopting circular practice in support of a sustainable and 'future ready' development.
- **Section 4 - Circular economy strategy:** presents the principles, actions and the goals that have been adopted to achieve a circular economy on the Proposed Development. This section also provides detail of the specific targets that are set, following the GLA Guidance. Opportunities for future action are also listed.
- **Section 4.2.1 - Sourcing and specification** outlines the key materials to be used in the development with specific considerations as to how resource efficiency and circular economy principles have been considered. It also details how these measures have been incorporated into the project specification and applied to the development. A bill of materials is also presented in this section.

## 2. Development Description

### 2.1 The Proposed Development

The Site for the Proposed Development comprises 0.48 hectares and is situated on the north side of Manchester city centre. It is classified as part of the Piccadilly Basin Strategic Regeneration Framework (SRF) area.

The Site is bordered by Great Ancoats Street to the north, Brownsfield Mill and a surface car park to the east, a surface car park to the south, and Port Street to the west. The Planning Application (132489/FO/2021) submitted requests permission for the development as described:

*“Full Planning Permission for the erection of a part-33, part-11 storey residential building with associated residents’ amenity space including gym (Use Class C3), commercial space (Use Class E), basement car parking, cycle parking, landscaping, and other associated works”*

The Site currently comprises brownfield land in the form of a surface level car park. A site location plan is provided in Figure 2.1.

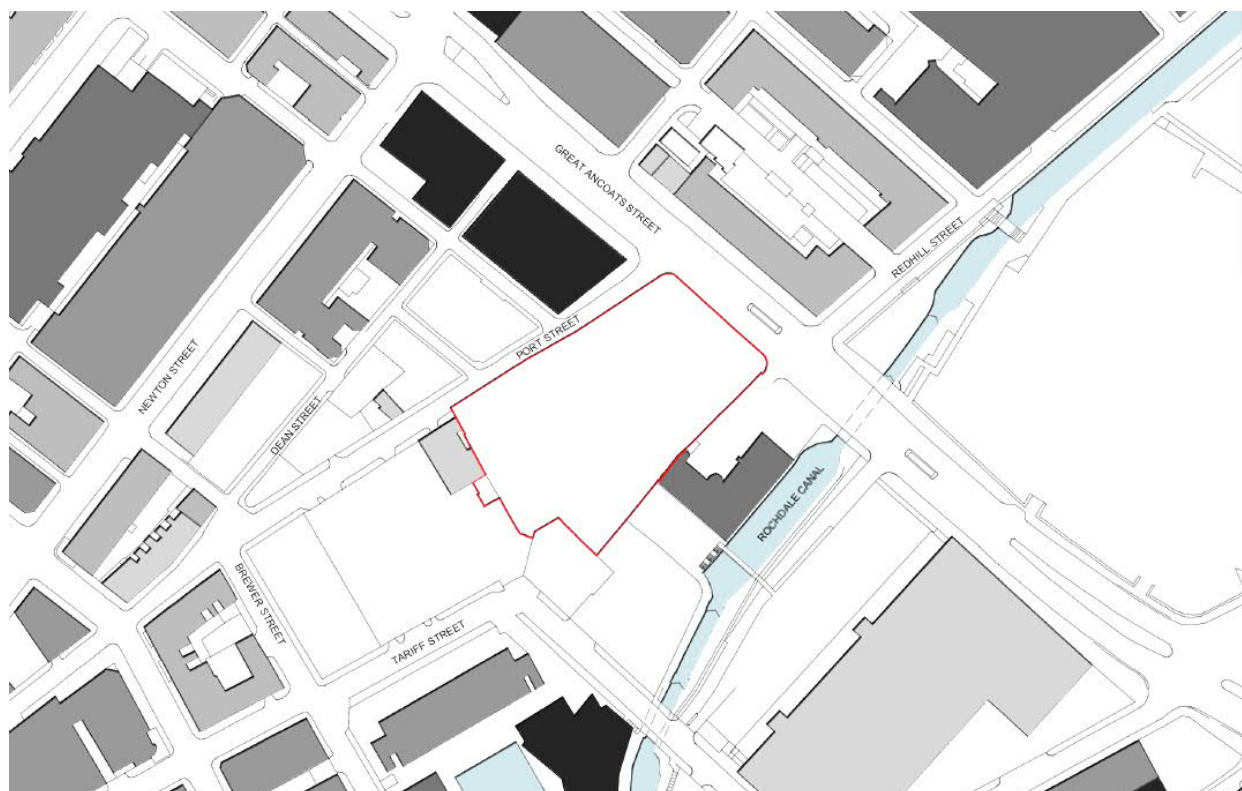


**Figure 2.1 Proposed Development Site Location Plan**

The development comprises a ‘ground plus 32-storey’ residential tower (33 stories in total) with a podium level containing residential units, residential amenity as well as commercial uses and underground car parking. The final design has been influenced by numerous factors including wind microclimate, public realm provision and the potential impact on the townscape and visual character of the area. The proposed development uses, mix, number of residential units and commercial floorspace within each building are described in **Table 2.1**.

**Table 2.1 Development Parameters**

| Measurement                  | Proposal                                                                                                                                              |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site Area                    | 0.48 hectares                                                                                                                                         |
| Development Floorspace       | 48,870 sq. (GIA)                                                                                                                                      |
| Residential (Use Class C3)   | Total: 477 homes<br>1 Bed 1 person (2.9%)<br>1 Bed 2 persons (29.4%)<br>2 Bed (65.6%)<br>3 Bed (2.1%)<br>Residential Amenity: 1167m <sup>2</sup>      |
| Commercial (Use Class E)     | 585m <sup>2</sup>                                                                                                                                     |
| Height                       | Ground plus 32 storeys (+152.500m AOD)                                                                                                                |
| External Areas               | 2,005 m <sup>2</sup>                                                                                                                                  |
| Car and Cycle Parking Spaces | 485 secure cycle parking spaces<br>38 car parking spaces (including 10 disabled spaces / 10 EV charging, with all spaces future proofed for adaption) |

Table adapted from Deloitte (2021) Port Street – ES Volume 1 [Z0-DEL-A180-Rp-XX-0001].

## 2.2 Design Evolution

During the design process, the architecture of the development underwent a series of revisions and refinements in response to feedback from MCC, statutory and non-statutory consultees and other stakeholders. Design moves were subsequently adopted with the aim of creating a solution that better addressed the concerns and requirements of the local community<sup>Error! Bookmark not defined.</sup>.

During previous design phases, several structural systems were considered and evaluated based on the project brief, architectural design intent, programme, and cost. Due to the building height, a reinforced concrete frame with cores and shear walls was chosen as the most appropriate solution. Outriggers were used in the tower core to improve its efficiency. Traditional reinforced concrete flat slabs were proposed for efficient floor solutions, though post-tensioned floor slabs were reviewed as an option. Ultimately, post-tensioned slabs were agreed to offer limited benefit to overall reduction, and previous cost analyses suggests they are also less cost-effective<sup>5</sup>.

<sup>5</sup> WSP (2022) Port Street - Structural Stage 3 Report SJC [Z0-WSP-A180-Rp-XX-0001]

In order to create a viable scheme and minimise any negative impacts on adjacent land uses and the environment, while also providing public benefits such as a significant amount of high-quality public realm, various options for scales and massing were evaluated for the development<sup>6</sup>.

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<sup>6</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

## 3. Circular Design Method Statement

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This section of the report outlines the relevant circular economy policy context, key definitions and design principles that underpin the resource efficiency and circular economy measures adopted for the Proposed Development, as outlined in the GLA Guidance<sup>7</sup>. Section 4 sets out the specific actions and targets adopted across the development in response to the policies, definitions and principles outlined within this section.

### 3.1 Policy Context

#### National Policy

In March 2022, the latest version of the GLA Guidance was adopted, which provides a policy framework for (*inter alia*) delivering a circular built environment.

For example, Policy SI7 'Reducing waste and supporting the circular economy,' includes specific requirements and targets for integrating circular economy principles into all stages of referable developments. To make this a reality, waste planning authorities and industry are expected to collaborate to achieve the following goals:

- Promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible.
- Encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products.
- Ensure that there is zero biodegradable or recyclable waste to landfill by 2026.
- Design developments with adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food
- To promote circular economy outcomes and achieve net zero-waste, any applicable applications should include a CES.

Other relevant national waste policies which have relevance to this CES, include:

- Ministry of Housing, Communities and Local Government (MHCLG), National Planning Policy Framework (2019);
- Ministry of Housing, Communities & Local Government (MHCLG), National Planning Policy for Waste (2014);
- Department for Environment, Food and Rural Affairs (DEFRA), Our Waste, Our Resources: A Strategy for England (2018); and
- HM Government, A Green Future: Our 25 Year Plan to Improve the Environment (2018).

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<sup>7</sup> Greater London Authority (2022) [London Plan Guidance: Circular Economy Statements](#)

## 3.2 Local Policy

Manchester's ambition and vision for the city is to be in the topflight of world-class cities by 2025<sup>8</sup>. The new Manchester Local Plan 'Core Strategy 2021 to 2027'<sup>9</sup>, is a plan for the future development of the Manchester city area and sets out the long-term strategic policies that accord. **Table 3.1** outlines the strategies of the Local Plan that are relevant to this CES.

**Table 3.1 Schedule of local policies of Core Strategy 2012 relevant to Circular Economy Statement**

| Policy Reference    | Policy Title         | Policy Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Policy EN 9</b>  | Green Infrastructure | New development will be expected to maintain existing green infrastructure in terms of its quantity, quality and multiple function. Where the opportunity arises and in accordance with current Green Infrastructure Strategies the Council will encourage developers to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between areas of green infrastructure. Where the benefits of a proposed development are considered to outweigh the loss of an existing element of green infrastructure, the developer will be required to demonstrate how this loss will be mitigated in terms of quantity, quality, function and future management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Policy EN 19</b> | Waste                | <ul style="list-style-type: none"> <li>Require all developers, including those of new waste management facilities within the District, to demonstrate the proposal's consistency with the principles of the waste hierarchy (prevention, reduction, re-use, recycling/composting, energy recovery, final disposal)</li> <li>Require all developers of new waste management facilities within the District to plan for and, where appropriate, use sustainable modes for waste transport, including use of modes such as rail and the Manchester Ship Canal.</li> <li>Require all developers to submit a waste management plan to demonstrate how both construction and demolition waste will be minimised and recycled on site wherever possible and how the sustainable waste management needs of the end user will be met.</li> <li>Have full regard to the economic and environmental benefits that well designed and run, waste management facilities can bring to the District, subject to any conditions required to protect the amenity of existing adjacent users.</li> <li>Promote the development of innovation and technological advancement within the sustainable waste management industry, aiming to achieve a closed-loop waste management system.</li> <li>Require waste management practices to have full regard to the environmental, social and economic impacts of such development</li> </ul> |

<sup>8</sup> Manchester City Council (2021) [State of the City Report 2021](#)

<sup>9</sup> Manchester City Council (2012) [Core Strategy 2012-2027](#)

| Policy Reference                          | Policy Title            | Policy Description                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           |                         | <p>and encourage long-term benefits in improving the environment, the regeneration of areas in need of investment and co-location with other employment uses where appropriate.</p> <ul style="list-style-type: none"> <li>• Encourage communities to take responsibility for the waste they create through the provision of accessible facilities.</li> </ul>                                                             |
| <b>Guide to Development in Manchester</b> | Environmental Standards | Section 4 of the guide states that developers will be expected to submit a statement on how their proposal will achieve the environmental standards set out in the document. This Environmental Standards Statement will clearly assist in demonstrating how the planning policy context has affected the development of the Proposed Development as required in the process of producing the Design and Access Statement. |

Table adapted from WSP (2021) Port Street - ESS & Sustainability Statement [Z0-WSP-A180-Rp-XX-008]

### 3.3 Circular Economy Design Approaches

#### Circular Economy Definition

There are a number of different definitions of the circular economy. The following represent industry recognised definitions which have been used to prepare and shape this CES.

As a starting point, the Ellen MacArthur Foundation defines circular economy as<sup>10</sup>:

*“a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution.”*

Therein, the circular economy is based on three principles, driven by design:

- ‘Eliminate waste and pollution’,
- ‘Circulate products and materials’ (at their highest value) and
- ‘Regenerate nature’.

These principles are underpinned by a transition to renewable energy and materials. Therein, a circular economy decouples economic activity from the consumption of finite resources. It is a resilient system that is good for business, people and the environment.

To achieve this transition, a framework of principles has been established in the GLA Guidance. For buildings, this entails developing a regenerative built environment that prioritises retention and refurbishment over demolition and rebuilding. It also involves designing buildings that are durable and adaptable to prolong their lifespan, and to enable the recovery, reuse or recycling of components and materials.

#### Circular Economy Design Principles

Eliminating and minimising waste (and subsequent disposal) will reduce potential polluting impacts to land, water, and air. The economic benefits of applying circular practice in the built environment

<sup>10</sup> Ellen MacArthur Foundation (2023) [What is a circular economy?](#)

include (for example): savings on cost on procurement of new virgin land, purchase of new materials, and management of less waste.

Moreover, the reduction in material and energy usage, can help reduce the embodied carbon impacts of buildings, which can in turn contribute towards the goal of achieving net zero carbon buildings and developments.

The reduction in material extraction, production, and transportation can also help reduce ecological impacts and reduce greenhouse gas emissions. In its application, and through these benefits, the circular economy supports social equity through skills development and well-being.

Interconnection between various energy and sustainability goals can drive circularity into building projects. For instance, the target of reducing Whole Life Carbon (WLC) impacts involves consideration of opportunities to reduce material usage and/or use of low impact materials, the energy and carbon reduction targets for the development align with the principle of minimising resource usage throughout the life of the development. A WLC Assessment<sup>11</sup> has been produced concurrently to this CES.

The principles in **Table 3.1** have been incorporated into the Proposed Development building design process to date, to respond to the conditions set down in the Environmental Statement<sup>12</sup>. Each principle aligns to the Waste Hierarchy (whereby avoiding or reducing waste is prioritised) and sustainable resource management good practice.

**Table 3.1 CE design principles and measures for new buildings**

| Principle                                          | Measure                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Building in layers</b>                          | Ensure that different parts of the building are accessible and can be maintained and replaced efficiently, where necessary.                                                                                                                                                                                                   |
| <b>Designing out waste</b>                         | Ensure that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build, and reuse of secondary products and materials.                                                                                                                             |
| <b>Designing for longevity</b>                     | Design to avoid a premature end of life for all components by considering maintenance and durability.                                                                                                                                                                                                                         |
| <b>Designing for adaptability or flexibility</b>   | Design by considering how a building might be easily altered to prolong its life, for instance by adaptation, addition or contraction, to suit new uses or patterns of use. This includes allowing easy rearrangement of internal fit-outs and arrangements to suit the evolving needs of occupants.                          |
| <b>Designing for replaceability or disassembly</b> | Design to facilitate easy removal and upgrade (ideally for reuse, remanufacturing or recycling) assets on a part-by-part basis. This includes allowing the building and its components to be taken apart with minimal damage. If designed well, it should be possible to replace any component in accordance with this ethic. |
| <b>Component or material reuse</b>                 | Use systems, elements or materials that can be reused and recycled: preferably in their original form and with minimal reprocessing. Preparation for reuse involves checking, cleaning or repairing materials so that they can be used again for their                                                                        |

<sup>11</sup> WSP (2023) Port Street – Whole Life Carbon Assessment

<sup>12</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

| Principle                             | Measure                                                                                                                                                                                                                                                                          |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | original purpose. Materials can be reused as a whole; redeployed as modules; or reused as a kit of parts on one or more different sites.                                                                                                                                         |
| <b>Material selection</b>             | Appropriate material choices are key to carbon reduction. Ensuring that there is synchronicity between materials selected and planned life expectancy of the building reduces waste and the need for replacement, thus reducing in use costs.                                    |
| <b>Minimise operational water use</b> | Choice of materials and durability of systems, to avoid leakage and subsequent building damage, contribute to reducing the carbon cost of water use.                                                                                                                             |
| <b>Building shape and form</b>        | Compact efficient shapes help minimise both operational and embodied carbon emissions for a given floor area. This means a more efficient building overall resulting in lower construction and in use costs.                                                                     |
| <b>Building life expectancy</b>       | Defining building life expectancy gives guidance to project teams as to the most efficient choices for materials and products. This aids overall resource efficiency, including cost efficiency and helps future proof asset value.                                              |
| <b>Local sourcing</b>                 | Sourcing local materials reduces transport distances and supply chain lengths and has associated local social and economic benefits.                                                                                                                                             |
| <b>Minimising waste</b>               | Waste represents an unnecessary and avoidable carbon cost. Buildings should be designed to minimise fabrication and construction waste, and to ease repair and replacement with minimum waste, which helps reduce initial and in-use costs.                                      |
| <b>Efficient fabrication</b>          | Efficient construction methods (e.g., modular systems, precision manufacturing and modern methods of construction) contribute to better build quality, reduce construction phase waste and reduce the need for repairs during post completion and the defects period (snagging). |
| <b>Lightweight construction</b>       | Lightweight construction uses less material which reduces the carbon footprint of the building as there is less material to source, fabricate and deliver to the Proposed Development.                                                                                           |
| <b>Regenerative design</b>            | Use of materials that can be returned to natural nutrient cycles once their function has been fulfilled. Removing CO <sub>2</sub> from the atmosphere through materials and systems absorbing it makes a direct positive contribution to carbon reduction.                       |

## Building in Layers

The GLA guidance recommends that building design and construction should follow a layered approach, where each layer has its own lifecycle and circular economy approach based on its respective function and expected lifespan.

Each layer should be independent, accessible, removable, and adaptable while retaining its value to support its reuse and recycling. Building layers include the site, façade, structure, substructure, building services, interior space, contents, and construction materials, each with a distinct lifespan as shown in Figure 3.1. The layered design of the building enables independent upgrades or replacements of the layers.

By considering the varied lifetimes of building components during the design process, the building becomes adaptable to different functions, typologies, volumes, and layouts, among others. Strict separation of building materials helps promote end-of-life strategies such as building and componentry reuse (repurposing), upcycling and recycling of materials, and energy recovery - all aligning with the principles of Design for Disassembly and circular economy goals.

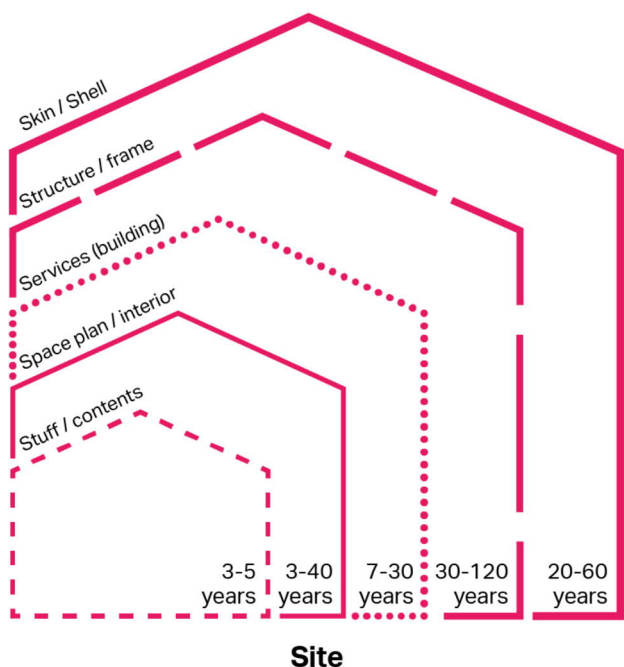


**Figure 3.1 Building layers and their indicative lifespans<sup>13</sup>**

<sup>13</sup> Adapted from Figure 2 in Greater London Authority (2022) [London Plan Guidance: Circular Economy Statements](#)

The decision tree in Figure 3.2 has been used to develop an appropriate design approach for the Proposed Development.

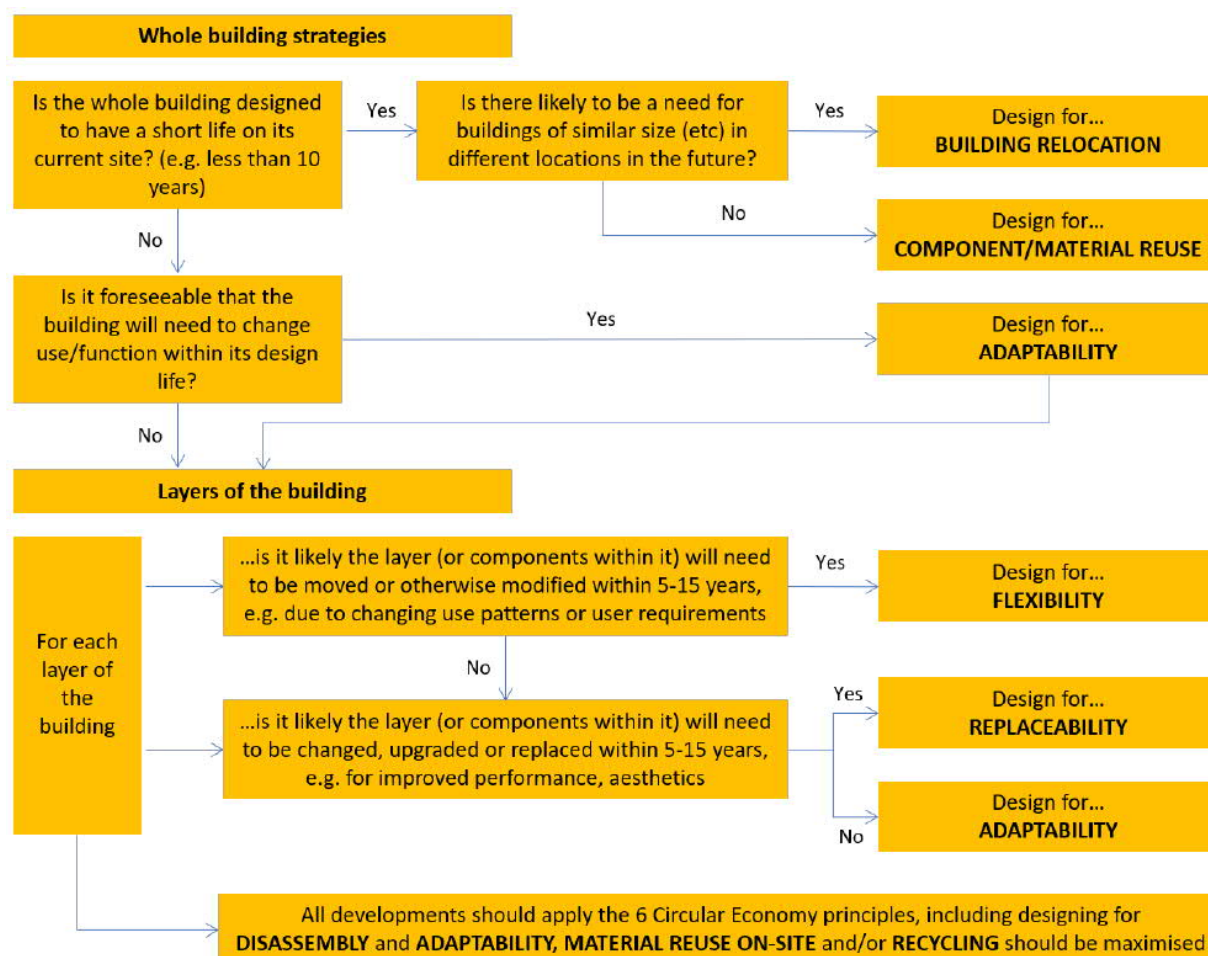


**Figure 3.2** Decision tree for design approaches for new buildings, infrastructure and layers over the lifetime of development<sup>14</sup>

<sup>14</sup> Adapted from Figure 5 in Greater London Authority (2022) [London Plan Guidance: Circular Economy Statements](#)

## 4. Proposed Development: Circular Economy Strategy

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This section presents the circular principles, goals and actions that have been adopted for the Proposed Development to date. It provides detail of the specific targets that have been agreed (following the GLA Guidance) and cross-references to the conditions set down through the Environmental Statement<sup>15</sup>.

### 4.1 Adopted design principles for the Proposed Development

#### Circular economy principles

The following design principles have been adopted during the design of the Proposed Development. These have been categorised based on the design principles presented in **Table 3.1**.

##### 1) Conserve resources, increase efficiency and source sustainably

Circular design of buildings, public spaces and supporting infrastructure is crucial as it can increase the longevity and value of materials and resources used. Manchester Port Street Ltd and its delivery partners have developed a 'lean-as-practicable' design to reduce the volume of materials consumed. Quality standards have been stipulated to suppliers of structural materials and internal fittings.

##### 2) Design to eliminate waste (and for ease of maintenance)

To minimise waste, it is important to start by preventing materials from becoming waste through thoughtful design and specification. This principle was taken into account from the beginning of the Proposed Development, aiming to create practical and positive outcomes from planning to the end of the building's life. The spaces have been designed to minimise resource use in construction, with the swimming pool included within the basement footprint to reduce excavation works. The superstructure elements have more than 50 years of corrosion protection, substructure elements are designed to last more than 50 years and concrete elements have a design life of at least 100 years, ensuring durability of materials. To facilitate the ease of maintenance, services have been routed in the most efficient manner, through the central core of the building and access panels have been incorporated into the design of bathrooms and kitchens to avoid destructive access. The development also deploys a cold water booster with four separate pumps, allowing for replacement of individual pumps opposed to the replacement of whole unit.

##### 3) Manage waste sustainably and at the highest value

After committing to the first two principles, it is essential to develop a waste management strategy for any waste generated during demolition, excavation, construction, and the activities of occupants. Waste management should follow the waste hierarchy, and transportation of waste should be consolidated, distances minimised, and clean transportation modes used whenever possible. The Proposed Development will work with contractors that can maximise recycling rates for challenging materials, for example, drywall will be segregated at a Waste Transfer Station, by our Waste Contractor, for recycling.

##### 4) Preserving and regenerating the natural environment

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<sup>15</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

Practicably preserving and regenerating the natural environment can be achieved by incorporating materials that can be returned to natural nutrient cycles once their function has been fulfilled. For example, this could include the use of timber formwork instead of steel where applicable. The Proposed Development will provide green roofing and landscaped areas, replacing the previously surface level carpark (hardstanding). This will create new public spaces for residents whilst encouraging the growth of ecosystems, insects and pollinators.

The following circular economy principles and commitments have been considered in the design stages, primarily as set out in the Environmental Statement<sup>15</sup> for the development. Manchester Port Street Ltd has identified circular economy opportunities for each layer of the development structure (based on the principle of 'Building in layers' as described in Section 3.3) including, 'Skin/shell', 'Structure/Frame', 'Services', 'Space / interior' and 'Contents'. The principles and commitments are presented in **Table 4.1**.

**Table 4.1 Circular economy principles and commitments for the Proposed Development broken down by building layer<sup>16</sup>**

| Principle                                                             | Commitments                                      | Design Layer                                   |                   |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                          |                                                                                                                                                       |
|-----------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                       |                                                  | Skin / shell                                   | Structure / Frame | Services                                                                                                                                                                                                                                                                                                                                                                                                                      | Space / interior                                                                                                                         | Contents                                                                                                                                              |
| <b>Conserve resources, increase efficiency and source sustainably</b> | <b>Minimise the quantities of materials used</b> | Design avoids overspecification of components. |                   | <p>Services are central through the building cores and routed in the most efficient manner, taking the shortest route to minimise use of material (e.g., cabling). Stack transfers are avoided between apartments, minimising material use.</p> <p>Oversizing of services has been avoided.</p> <p>The size and dimensions of services has been taken into account in the design to avoid excessive cut offs and wastage.</p> | The swimming pool was included within the basement footprint, to reduce the extent of excavation works required, and arisings generated. | Apartment kitchens have been designed to suit the layouts in the most efficient manner, increasing in size only with the occupancy (1, 2, or 3 beds). |

<sup>16</sup> Based on tables 6.22 and 6.23 in Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

| Principle | Commitments                                                                                                                                              | Design Layer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                                                                                                                                                                                                                                        |                                                                                                                                                                  |                                                                                                                                                                                                                              |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                                                                                                                          | Skin / shell                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Structure / Frame | Services                                                                                                                                                                                                                               | Space / interior                                                                                                                                                 | Contents                                                                                                                                                                                                                     |
|           | <b>Minimise the quantities of other resources used (e.g., technological assets)</b>                                                                      | The construction management plan includes measures to reduce waste, implement waste segregation, use just-in-time procurement, and offer recycling services.                                                                                                                                                                                                                                                                                                                                                                                      |                   | The design utilises a combined ventilation system for the basement, which can be used for both environmental ventilation and smoke clearance when required. This removes the need for secondary infrastructure, reducing material use. | A skylight has been incorporated into the swimming pool, integrated within the landscape - providing natural light and reducing the need for artificial lighting | The building provides common facilities, like a gym, which can be used by multiple individuals, reducing the need for residents acquire their own equipment, and thus demonstrating the circular principle of shared assets. |
|           | <b>Specify and source materials and other resources responsibly and sustainably (including through the use of locally sourced and recycled material)</b> | Structural systems prioritise recycled materials like steel, aggregates, and cement with high recycled content to reduce primary material demand.<br><br>The Proposed Development will reduce primary material demand by using recycled content such as GGBS in concrete where this material is available (see Appendix B for percentages of GGBS across individual building elements) and aiming for high levels of recycled content within reinforcing steel (ranging from 90-95% to 100% of recycled content subject to manufacturing source). |                   | Not applicable                                                                                                                                                                                                                         |                                                                                                                                                                  | Not applicable                                                                                                                                                                                                               |

| Principle | Commitments                                                                                                                       | Design Layer                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                       |                |                                                                                                                                                                                                                                                                                                                                                                     |                |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|           |                                                                                                                                   | Skin / shell                                                                                                                                                                                                                                                                                                                                | Structure / Frame                                                                                                                                                     | Services       | Space / interior                                                                                                                                                                                                                                                                                                                                                    | Contents       |
|           | <b>Reuse and retrofit of existing buildings</b>                                                                                   | Not applicable                                                                                                                                                                                                                                                                                                                              | Not applicable                                                                                                                                                        | Not applicable | Not applicable                                                                                                                                                                                                                                                                                                                                                      | Not applicable |
|           | <b>Reuse of components and materials with minimal processing</b>                                                                  | As the development is situated on an existing car park, there is limited opportunity to recover and reuse existing materials. However, the use of crushed and graded demolition material from ground floor slabs has been considered for use in the piling mat. There are only modest opportunities to recycle it within concrete mixtures. |                                                                                                                                                                       |                |                                                                                                                                                                                                                                                                                                                                                                     |                |
|           | <b>Material selection based on life expectancy of the building and embodied resource demands and/or maintenance requirements.</b> | Natural and low-carbon materials with minimal processing will be selected for elements in the Shell/Skin of the building. For example, when designing the podium and brick facade, the development has considered brickwork on Steel Frame Systems (SFS) (recognising the value of BREEAM Green Guide rating A+ standards). The             | Exposed steelwork and concrete wearing surfaces specified in the design will require periodic inspection and maintenance, to function properly for at least 50 years. |                | Natural and low-carbon materials with minimal processing will be selected for elements in the Space of the building.<br><br>For example, the Proposed Development has carefully chosen durable materials - like porcelain tiles - for reception and common areas, to withstand the high traffic demand and significantly reduce the need for repair or replacement. |                |

| Principle | Commitments | Design Layer                                                                                                                                                                                                                                                                                                                               |                   |          |                  |          |
|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|------------------|----------|
|           |             | Skin / shell                                                                                                                                                                                                                                                                                                                               | Structure / Frame | Services | Space / interior | Contents |
|           |             | <p>cavity within the building shell / skin has also been adjusted to reduce the volume of steel required for the brick supports.</p> <p>Rockwool insulation, and a low u value (as a measurement of thermal transmittance) have been specified across the scheme, which will reduce the energy consumption through the scheme lifespan</p> |                   |          |                  |          |

| Principle                                                      | Commitments                                                                                                                          | Design Layer                                                                                                                              |                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                    |                                                                                         |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                |                                                                                                                                      | Skin / shell                                                                                                                              | Structure / Frame                                                                                                                                                                                                                                                           | Services                                                                                                                                                                                                                              | Space / interior                                                                                                                                                                                                   | Contents                                                                                |
|                                                                | <b>Efficient fabrication through the use of modern methods of construction (e.g., modular systems, precision manufacturing etc.)</b> | Resource-efficient methods of manufacturing such as off-site manufacturing / prefabrication, will be used for elements of the Shell/Skin. | The structural frame will use in-situ concrete materials using recycled content and GGBS, where possible.                                                                                                                                                                   | Production-efficient methods such as off-site manufacturing will be used for elements of the services (and space/interior) where possible, reducing material wastage that commonly arises with typical approaches to on-site fitting. | Not applicable                                                                                                                                                                                                     | Not applicable                                                                          |
|                                                                | <b>Use of lightweight materials</b>                                                                                                  | Not applicable                                                                                                                            | Concrete grades will be reviewed to reduce the weight of reinforcement.                                                                                                                                                                                                     | Lightweight plastic pipework will be used within apartments, rather than copper.                                                                                                                                                      | Lightweight partitions will be used within units and communal areas to minimise material use.                                                                                                                      | Not applicable                                                                          |
| <b>Design to eliminate waste (and for ease of maintenance)</b> | <b>Design for longevity and durability</b>                                                                                           | Not applicable                                                                                                                            | Superstructure elements that are not easily accessible have generous corrosion protection, exceeding 50-year life for predicted environmental conditions. Substructure elements cast against ground are designed for a working life of more than 50 years. Concrete element | Not applicable                                                                                                                                                                                                                        | Double layer plasterboard has been specified in common areas for additional robustness.<br><br>Access panels have been incorporated into the design of bathrooms and kitchens <i>in lieu</i> of destructive access | Door stoppers will be provided within the apartment to avoid damage to the doors/walls. |

| Principle | Commitments                                        | Design Layer                                                                                                                     |                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                  |
|-----------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                    | Skin / shell                                                                                                                     | Structure / Frame                                                                                                                                                                                                             | Services                                                                                                                                                                                                                                                         | Space / interior                                                                                                                                                                                                                                                                           | Contents                                                                                                                                                                                                         |
|           |                                                    |                                                                                                                                  | design meets an 'At least 100 years' designation in accordance with BS 8500 Concrete - Guidance and Specifications                                                                                                            |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                  |
|           | <b>Designing for adaptability and flexibility</b>  | Higher cladding line loads have been used to allow for façade flexibility and the introduction of future technologies.           | A flat slab (with flat soffit) has been used to allow flexibility to change the services layout, if required in future.<br><br>Columns and foundations have been designed with spare structure capacity for one extra storey. | As a general principle, adaptability and flexibility will be considered for the design of the 'Services and Space' layouts to minimise waste generation during maintenance and future reconfigurations. Further detail will be provided at future design stages. | A uniformly distributed load allowance has been made for non-structural partitions, so that in-resident layout can be changed in future.<br><br>The floor-to-floor height has been designed for flexibility and future conversion, with consideration for both office and residential use. | Open plan layouts have been designed to suit the variety in residents' lifestyles and use of spaces across the building lifespan. This open plan approach allows the spaces to adapt as residents' needs evolve. |
|           | <b>Designing for replaceability or disassembly</b> | The design considers future disassembly and recycling opportunities. For example, the tower has been designed with modular items |                                                                                                                                                                                                                               | The development uses a cold water booster with four separate pumps. This means that, should one fail, the                                                                                                                                                        | The plasterboard used on internal walls and ceilings can also be reutilised.                                                                                                                                                                                                               | Proposed internal finishes and decoration, whilst high quality and                                                                                                                                               |

| Principle | Commitments                                                                        | Design Layer                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                                             |                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                                                    | Skin / shell                                                                                                                                                                                                                                                                                                                                     | Structure / Frame                                                                                                                                                                                                   | Services                                                                                                           | Space / interior                                                                                                                            | Contents                                                                                                                                   |
|           |                                                                                    | <p>- such as unitised curtain walls - that can be easily replaced, upgraded and disassembled.</p> <p>The technical design stage of the project will consider additional 'design for disassembly' principles, such as bolted joints.</p> <p>The podium has also been designed with bricks that can be reutilised when replaced or dismantled.</p> |                                                                                                                                                                                                                     | individual pump can be replaced rather than the whole unit.                                                        |                                                                                                                                             | <p>durable, can easily be replaced and maintained if required i.e.:<br/>Luxury Vinyl Tile flooring (LVT),<br/>carpets, furniture, etc.</p> |
|           | <b>Design out construction, demolition, excavation and municipal waste arising</b> | The design takes into consideration the different levels already existing on site, to minimise the excavation of materials.                                                                                                                                                                                                                      | Use of crushed and graded demolition material from ground floor slabs excavated on the Proposed Development will, subject to further suitability analysis, be used in the temporary piling mat during construction. | Some plantrooms have been located in otherwise unusable areas of the basement, to best utilise the space available | The swimming pool was designed within the basement footprint, but without encroaching the tower core foundations, reducing excavation depth | Not applicable                                                                                                                             |
|           | <b>Design building shape and form for efficient</b>                                | Not applicable                                                                                                                                                                                                                                                                                                                                   | The building's main tower floor plan and core wall arrangement has adopted a regular                                                                                                                                | The layout and shape of the building allows for central distribution of services and the tall tower shape is very  | Not applicable                                                                                                                              | Not applicable                                                                                                                             |

| Principle | Commitments                                           | Design Layer |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                  |                  |          |
|-----------|-------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|----------|
|           |                                                       | Skin / shell | Structure / Frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Services                                                         | Space / interior | Contents |
|           | <b>material use during construction and operation</b> |              | <p>and repeated square shape which allows for efficiency in slab design, column design, stability, cladding uniformity and eliminates the need for transfer structures.</p> <p>The main tower core pile cap has been raised to the underside of the basement slab (typically set to the base of any lift shafts) and is designed as a 'donut' style cap to reduce excavation depths on the Proposed Development and improve efficiency in design.</p> <p>Floor slab analyses will allow for incremental deflections during design life (rather than making assumptions). This improves the efficiency of the slab and in turn</p> | <p>efficient for minimising services runs to each apartment.</p> |                  |          |

| Principle                       | Commitments                            | Design Layer   |                                                                                                                                                                                                                                                                        |                                                                                 |                                                                       |                |
|---------------------------------|----------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------|
|                                 |                                        | Skin / shell   | Structure / Frame                                                                                                                                                                                                                                                      | Services                                                                        | Space / interior                                                      | Contents       |
|                                 |                                        |                | <p>reduces reinforcement requirements.</p> <p>The Proposed Development has the strength and capacity to allow for temporary loading scenarios, and works, that will avoid the need for additional propping and construction of independent foundations with piles.</p> |                                                                                 |                                                                       |                |
| <b>Manage waste sustainably</b> | <b>Manage/ minimise demolition and</b> | Not applicable | Use of crushed and graded demolition material from ground                                                                                                                                                                                                              | Incoming services from the adjacent highway take the shortest route possible to | Plasterboard wastes will be taken to a Waste Transfer Station, by our | Not applicable |

| Principle                | Commitments      | Design Layer                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    |                  |                                                |
|--------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------|------------------------------------------------|
|                          |                  | Skin / shell                                                                                                                                                                                                                                                                                                                                                                         | Structure / Frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Services                                           | Space / interior | Contents                                       |
| and at the highest value | excavation waste |                                                                                                                                                                                                                                                                                                                                                                                      | <p>floor slabs excavated on the Proposed Development will, subject to further suitability analysis, be used in the temporary piling mat during construction.</p> <p>Reuse of existing materials and suitable treatment of hazardous soil have also been investigated. Opportunities will be explored for the relocation and reuse of noncontaminated soils, within the site. An authorised contractor will be appointed to remove and dispose of any hazardous soils which cannot be reused on the site.</p> | minimise length of trench required to be excavated |                  | Waste Contractor, and recycled where possible. |
|                          | Manage/minimise  | The construction management plan outlines measures to minimise waste generation, reuse materials for temporary works, implement a clear labelling system for waste segregation, use just-in-time procurement, store materials correctly, utilise plasterboard recycling services, offer take-back schemes for packaging materials, and engage staff through training <sup>17</sup> . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    |                  |                                                |

<sup>17</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

| Principle | Commitments                                                                                    | Design Layer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                |                  |                                                                                            |
|-----------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|------------------|--------------------------------------------------------------------------------------------|
|           |                                                                                                | Skin / shell                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Structure / Frame | Services       | Space / interior | Contents                                                                                   |
|           | construction waste                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                |                  |                                                                                            |
|           | <b>Manage/ minimise municipal waste (and industrial waste) during operation, if applicable</b> | <p>Waste will be cleared daily to a main holding skip, and each floor will have a designated waste area with bins. The waste will be segregated into five categories at an off-site waste transfer station; the categories are:</p> <p>CAT A: Hazardous waste – Paint tins, mastic etc</p> <p>CAT B: Metal</p> <p>CAT C: Timber</p> <p>CAT D: Plasterboard</p> <p>CAT E: General Waste</p> <p>Waste collection suppliers will sort waste for recycling (providing relevant percentage data), and hazardous waste will be stored separately</p> |                   |                |                  |                                                                                            |
|           | <b>Minimise operational water use and other 'peripheral'</b>                                   | The construction management plan outlines measures to minimise waste generation, reuse materials for temporary works, implement a clear labelling system for waste segregation, use just-in-time procurement,                                                                                                                                                                                                                                                                                                                                  |                   | Not applicable | Not applicable   | All sanitary fittings shall be complete with flow restrictors to limit the flow to 9l/m to |

| Principle                                                  | Commitments                                                                                                     | Design Layer                                                                                                                                                   |                   |                |                                                                                                                                                   |                                                                                                                                                                                                           |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            |                                                                                                                 | Skin / shell                                                                                                                                                   | Structure / Frame | Services       | Space / interior                                                                                                                                  | Contents                                                                                                                                                                                                  |
|                                                            | <b>materials during construction</b>                                                                            | store materials correctly on-site, utilise plasterboard recycling services, offer take-back schemes for packaging materials, and engage staff through training |                   |                |                                                                                                                                                   | each shower, 4.5l/m to each wash hand basin. The mechanical contractor shall supply and install flow restrictors of 5.0l/m to each kitchen sink and all the accessible and adaptable apartment bathrooms. |
| <b>Preserving and regenerating the natural environment</b> | <b>Use of materials that can be returned to natural nutrient cycles once their function has been fulfilled.</b> | The Proposed Development will provide green roofing and landscaped areas, replacing the previously surface level carpark (hardstanding)                        | Not applicable    | Not applicable | When timber resources reach the end of their lifespan, opportunities will be explored that allow for this material to be recycled where possible. | not applicable                                                                                                                                                                                            |
|                                                            | <b>Use of carbon-absorbing materials</b>                                                                        |                                                                                                                                                                | Not applicable    | Not applicable | Not applicable                                                                                                                                    | In built furniture and kitchens will utilise robust materials to maximise durability                                                                                                                      |

## 4.2 CE Targets

High level targets have been made for the following materials: these are explained in greater detail in Section 5.

**Table 4.2 Targets and specification set for key materials<sup>18</sup>**

| Material | Type              | Targets and specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Concrete | Cement            | <p>Concrete will be specified to be sourced in accordance with BES 6001 Framework Standard for Responsible Sourcing, level “Very Good” or equivalent.</p> <p>Use of Ground Granulated Blast-furnace Slag (GGBS) in place of Portland cement where GGBS is available (see Appendix B for anticipated percentage GGBS for each building element).</p> <p>Embodied carbon of all concrete mixes to be provided by site contractors, in accordance with BS EN 15978:2011 Sustainability of construction works.</p>                                                                                                                                                                                                                                                                                                                                                                                            |
|          | Aggregate         | Recycled aggregates will be used where applicable and where permitted in accordance with the Structural Specification for the Proposed Development.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Masonry  | Masonry           | <p>Masonry will be specified to be sourced in accordance with BES 6001 Framework Standard for Responsible Sourcing level “Good” or equivalent. The masonry materials on the Proposed Development achieve the following grades:</p> <ul style="list-style-type: none"> <li>• Facing Bricks – MichelMersch Porcelain White Brick– compliant with BES 6001 Very Good Rating</li> <li>• Coloured Mortars – Tarmac Mortars – compliant with BES 6001 Excellent Rating</li> <li>• Facing Bricks – Crest Buckingham Multi – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement</li> <li>• Masonry Support – IG/ Keystone Group – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement, and are seeking BES 6001 accreditation during 2024</li> </ul> |
| Steel    | Reinforcing steel | <p>Reinforcement will be specified to be sourced, where possible, in accordance with BES 6001 Framework Standard for Responsible Sourcing, level “Good”, Eco- reinforcement or equivalent.</p> <p>Reinforcing steel used across the proposed development will contain 90-95% recycled steel material, where possible, with steel sourced from Electric Arc Furnace processes containing 100% recycled steel content.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Structural steel  | Grade S355 steel will generally be adopted in the design and in accordance with the following technical delivery requirements unless otherwise specified:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

<sup>18</sup> Deloitte (2021) Port Street - Environmental Statement Volume 1 [Z0-DEL-A180-Rp-XX-0001]

| Material      | Type   | Targets and specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |        | <ul style="list-style-type: none"> <li>• BS EN 10 025 Hot rolled products of structural steels - Technical delivery conditions for non-alloy structural steels (Parts 2 to 6)</li> <li>• BS EN 10210-1 Hot finished structural hollow sections of non-alloy and fine grain steels; and</li> <li>• BS EN 10219-1 Cold formed welded structural hollow sections of non-alloy and fine grain steels).</li> </ul> <p>The project specification states that 100% of structural steel will be sourced, where possible, from a BES6001 Framework Standard for Responsible Sourcing or Environmental Management System (EMS) certified supplier to a certification standard of “very good” with a minimum content from ResponsibleSteel™ Certified Steel (or equivalent) or Low Embodied Carbon Steel. Whilst our Steel Frame System (SFS) Manufacturer do not hold BES 6001 certification, Environmental Product Declarations will be provided.</p> |
| <b>Timber</b> | Timber | 100% of Timber used for formwork will be responsibly sourced and obtained from well managed forests or plantations in accordance with the laws governing forest management. Documentary evidence will be supplied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 5. Sourcing and specification

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This section outlines the key materials to be used in the development with specific considerations as to how resource efficiency and circular economy principles have been considered. It also details how these measures have been incorporated into the project specification and applied to the development. A bill of materials is also presented in this section.

### 5.1 Material selection

Material efficiency has been a key aspect of the design process, with the goal of reducing material demand and waste throughout the building's life cycle. This has involved exploring measures to optimise material use during design, procurement, construction, maintenance, and end-of-life stages.

The design team has considered environmental impact as a key performance indicator when reviewing options, favouring low impact materials that are supported (where available) by Environmental Product Declaration certification.

Ultimately, material efficiency and carbon reduction efforts have reduced the quantities of new materials used in the development and promoted sustainable building practices. Examples are now presented.

### Concrete & Masonry

Concrete and masonry will be specified to be sourced in accordance with BES 6001 level “Very Good” or equivalent. Contractors are expected to state the “cradle to gate” embodied carbon of all concrete mixes in accordance line with BS EN 15978<sup>19</sup>.

#### Cement replacement

Portland cement is a major contributor to global CO<sub>2</sub> emissions. Cementitious waste products, such as Pulverised Fuel Ash (PFA) and Ground Granulated Blast-furnace Slag (GGBS). GGBS and PFA are by-products of steel manufacturing and power generation that can replace up to 80% of Portland cement content in concrete, reducing its embodied energy and embodied CO<sub>2</sub> by over 40%, fly ash by over 20%, and limestone fines by 15%.

GGBS is proposed for a number of concrete elements on the proposed development, subject to availability. For example, Manchester Port Street Ltd will use seek to use high GGBS mixes in the ground large pours such as the cap foundation for the tower (500m<sup>3</sup> at 60% GGBS), and 20-30% GGBS for other elements (as shown in Appendix B). There are two mixes shown for these latter elements, with some mixes at 20-30% and some with 0% (this reflects summer and winter mixes, respectively). The possibility of increasing the proportion of GGBS will be explored as the design advances. The various advantages and disadvantages associated with the use of GGBS and PFA are listed in **Table B1** (also Appendix B), when compared to Portland cement<sup>20</sup>.

Concrete grades will also be reviewed to reduce the weight of reinforcement. All contractors must consider the slower strength gain for high cement-replacement mixes and make allowances in the

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<sup>19</sup> WSP (2023) Port Street - NBS Specification [Z0-WSP-A180-Sp-XX-0003]

<sup>20</sup> WSP (2022) Port Street - Structural Stage 3 Report SJC [Z0-WSP-A180-Rp-XX-0001]

construction programme. The use of lower cement replacement mixes will only be accepted under prior agreement for unexpected circumstances<sup>21</sup>.

## Masonry

The Proposed Development will incorporate masonry materials which will achieve the following grades:

- Facing Bricks – MichelMersch Porcelain White Brick– compliant with BES 6001 Very Good Rating
- Coloured Mortars – Tarmac Mortars – compliant with BES 6001 Excellent Rating
- Facing Bricks – Crest Buckingham Multi – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement
- Masonry Support – IG/ Keystone Group – whilst these materials do not hold BES 6001 certification; the Developer has produced a dedicated sustainability policy/statement, and are seeking BES 6001 accreditation during 2024.

## Aggregates

Recycled and secondary aggregates can be used as a substitute for traditional concrete aggregates obtained through quarrying and marine dredging, reducing the environmental impact of the concrete production process. The use of recycled concrete aggregate, recycled masonry, and industrial by-products such as China Clay Waste can reduce the carbon footprint of concrete.

The use of recycled aggregates in concrete has been specified by the design team for designated concrete applications for the binding to basement slab, pile caps, retaining walls<sup>21</sup>. Where additional opportunities arise to incorporate aggregate into the Proposed Development, efforts will be made to source recycled aggregate where suitable, subject to adherence to the Structural Specification for the Proposed Development.

## **Steel**

### Reinforcing steel

Global consumption of steel continues to rise, mainly as a consequence of industrialisation in developing countries. Despite international supply and demand challenges, and rising costs of primary steel, significant movements continue to be made in industry to evidence recycled content in steel. Recent action in the UK has also been taken to evidence the carbon and cost benefits of steel refabrication and reuse.

Steel reinforcement will be specified to be sourced in accordance with BES 6001 level “Good”, Eco- reinforcement or equivalent<sup>23</sup>. Reinforcing steel on the UK market typically contains 90-95% recycled content and, where specific products containing 100% recycled steel can be acquired, these will be pursued, subject to cost and quality.

### Structural steel

Grade S355 steel will be specified in accordance with BS EN 10 025 (Parts 2 to 6), BS EN 10210-1 and BS EN 10219-1, ready for adoption in the design<sup>23</sup>.

Furthermore, the Proposed Development specification states that all structural steel should, where possible, be sourced from a BES6001 or EMS certified supplier to a certification standard of “very good”. Whilst our Steel Frame System (SFS) Manufacturer do not hold BES 6001 certification, Environmental Product Declarations will be provided.

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<sup>21</sup> WSP (2023) Port Street - NBS Specification [Z0-WSP-A180-Sp-XX-0003]

Structures will be assembled off-site as far as practicable which will reduce on-site waste generation.

All steel will be supplied from steelmaking sites that meet Conditions 1 and 2 (listed below) and "Minimum Content"<sup>21</sup>. These conditions are presented as stated within the specification.

- Condition 1:
  - ▶ A site whose corporate owner has made a public commitment to develop and make public both a long-term emissions reduction pathway and a medium-term, quantitative science-based GHG emissions target for the corporation. A science-based target approved by the SBTi (Science Based Targets initiative), or other quantitative, scientifically justified target of comparable ambition, quality and coverage would meet this requirement in full, **Or**
  - ▶ A site that is publicly committed to achieving ResponsibleSteel™ certification, or certification to an equivalent international standard.
- Condition 2:
  - ▶ A site that discloses the GHG emissions intensity of the crude steel produced at the site (tonnes CO<sub>2</sub>e/ tonne crude steel), together with the proportion of scrap iron/steel that is used as an input material for steel production, to allow assessment of performance as specified in the SteelZero definition of 'Low Embodied Carbon Steel' (\*see below).
- Minimum Content:
  - ▶ From 1st January 2022, a minimum percentage of the steel procured for the project should comply with at least one of the conditions below:
  - ▶ Steel produced by a steelmaking site where the site's corporate owner has defined and made public both a long-term emissions reduction pathway and a medium-term, quantitative science-based GHG emissions target for the corporation. A science-based target approved by the SBTi (Science Based Targets initiative), or other quantitative, scientifically justified target of comparable ambition, quality and coverage would meet this interim requirement in full.
  - ▶ ResponsibleSteel™ Certified Steel, or steel meeting an equivalent international standard.
  - ▶ Low Embodied Carbon Steel. Defined as crude steel with a GHG emissions intensity (tonnes CO<sub>2</sub>e/ tonne crude steel) of less than or equal to the values below, depending on the percentage of scrap steel used in its production<sup>22</sup>.
    - For steel procured in 2022: 5%
    - For steel procured in 2023: 10%
    - For steel procured in 2024: 15%

## Timber

Timber used for formwork will be responsibly sourced<sup>23</sup>. Timber (including timber for wood-based products) will be obtained from well managed forests or plantations in accordance with the laws

<sup>22</sup> SteelZero Low Embodied Carbon Steel threshold – to be finalised by SteelZero subject to consultation

<sup>23</sup> WSP (2023) Port Street - NBS Specification [Z0-WSP-A180-Sp-XX-0003]

governing forest management in the producer country or countries and international agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora.

Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied will be obtained. Suppliers will be asked to evidence that they have adopted - and are implementing - a formal environmental purchasing policy for timber and wood-based products<sup>24</sup>.

## 5.2 Bill of materials

A summary of the Bill of Materials (BOM) for the Proposed Development is summarised below. This will be updated on an ongoing basis across construction of the development.

**Table 5.1 Bill of materials**

| Ref | Description                       | Quantity | Unit           |
|-----|-----------------------------------|----------|----------------|
| 1   | RF Concrete                       | 19,089   | m <sup>3</sup> |
| 2   | Unitised curtain walling to Tower | 11,937   | m <sup>2</sup> |
| 3   | Hot melt roof                     | 1,770    | m <sup>2</sup> |
| 4   | Green Roofing                     | 398      | m <sup>2</sup> |
| 5   | Glazing to Podium (Aluminium      | 2,198    | m <sup>2</sup> |
| 6   | Stick Curtain Walling to Podium   | 572      | m <sup>2</sup> |
| 7   | Brickwork                         | 3,060    | m <sup>2</sup> |
| 8   | Blockwork                         | 2,702    | m <sup>2</sup> |
| 9   | Steel Framing System (SFS)        | 5,058    | m <sup>2</sup> |
| 10  | MF Ceilings                       | 32,438   | m <sup>2</sup> |
| 11  | Internal Dry Lined Walls          | 52,000   | m <sup>2</sup> |
| 12  | Timber doors                      | 3,066    | m <sup>2</sup> |
| 13  | Carpets                           | 14,598   | m <sup>2</sup> |
| 14  | Laminate Flooring                 | 17,622   | m <sup>2</sup> |
| 15  | Porcelain Wall and Floor Tiles    | 34,744   | m <sup>2</sup> |
| 16  | Skirting Board - timber           | 33,390   | m              |

<sup>24</sup> WSP (2023) Port Street - NBS Specification [Z0-WSP-A180-Sp-XX-0003]

# Appendix A

## Waste Volume Forecast

An indicative waste forecast was developed by Curtins<sup>25</sup> for the development based upon the following units. The data in brackets shows how these numbers have, since the forecast was developed, slightly changed.

- 485 residential units (now amended to 477 residential units (Use Class C3); and
- 600m<sup>2</sup> of commercial (now amended to 585m<sup>2</sup> (Use Class E), at the ground floor and assumed to be Food & Beverage).

Whilst the number of units and coverage for commercial space has changed, in both cases, they reflect a reduction. It is hence reasonable to assert that the data in **Table A1** are conservative, and likely to improve in reality.

In this context, **Table A1** forecasts the total weekly forecasted waste volume for the development based. The main waste streams for the residential uses are:

- General waste (comprising non-recyclable waste);
- Dry Mixed Recycling (comprising cardboard, paper, plastic and tin);
- Glass recycling; and
- Organic recycling

**Table A1** Weekly Waste Volume Forecast and bin requirement<sup>27</sup>

| Use                | Waste stream    | Weekly          | No. of      |
|--------------------|-----------------|-----------------|-------------|
| <b>Residential</b> | Non-recyclable  | 59,849L         | 14 x        |
|                    | Dry Mixed       | 28,728L         | 7 x         |
|                    | Glass Recycling | 28,728L         | 7 x         |
|                    | Organic         | 2,394L          | 3 x         |
|                    | <b>TOTAL</b>    | <b>119,698L</b> | <b>28 x</b> |
| <b>Commercial</b>  | Non-recyclable  | 6,737L          | 4 x         |
|                    | Dry Mixed       | 4,042L          | 2 x         |
|                    | Glass Recycling | 1,684L          | 1 x         |
|                    | Organic         | 1,010L          | 3 x         |
|                    | <b>TOTAL</b>    | <b>13,473L</b>  | <b>7 x</b>  |
| <b>DEVELOPMENT</b> |                 | <b>133,171L</b> | <b>35 x</b> |

<sup>25</sup> Curtins (2021) Waste Management Strategy [Z0-CUR-A180-Rp-XX-021\_Ver1]

Given the potential waste volumes forecast during the operational phase of the development, the most suitable containers for the general waste and recycling streams would be a combination of 1,100L Eurobin and 240L wheelie bins. It is envisaged that initially 50% of the bins in store would be dedicated to recycling, combining mixed recycling, glass and organic food. This percentage could be increased at any point, with the aim to achieve future government goals<sup>26</sup>.

The commercial waste would be split into three principal streams, with the possibility of organic recycling being included for future purposes:

- General waste (non-recyclable waste)
- Dry mixed recycling (including cardboard, paper, plastic, and tin)
- Glass recycling
- Organic recycling (if necessary)

A combination of scheduled Council collections and private contracting would be utilised for waste collection. The building management company (Affinity Living) would be accountable for monitoring and promoting high recycling rates. This is expected to be achieved by imparting information on the advantages of recycling and how to segregate waste. Recycling bins are expected to be positioned closer to the access gates (by comparison with the waste bins), to help encourage good practices from residents.

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<sup>26</sup> Affinity Living (2022) Port Street - Operational Management Plan [Z0-VIT-A180-Rp-XX-015]

# Appendix B

## Cement Replacement

Table B1 Cement replacement pros and cons<sup>27</sup>

| Property                    | GGBS                                                                                                 | PFA                                                                                                                                    |
|-----------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Water content</b>        | Slight reduction, 0.5-1.0% per 10% of GGBS                                                           | Considerable reduction, 3% per 10% of pfa                                                                                              |
| <b>Workability</b>          | Improved                                                                                             | Improved                                                                                                                               |
| <b>Setting time</b>         | Slightly increased                                                                                   | Slightly increased                                                                                                                     |
| <b>Strength</b>             | Lower early age and 28-day strength for a given cement content. Higher final strength                | Lower early age and 28-day strength for a given cement content. Higher final strength. Advisable to increase PFA content (mass) by 10% |
| <b>Appearance</b>           | Lighter in colour. Good finish                                                                       | Inconsistent dark patches. Not good for high specification exposed finishes                                                            |
| <b>Heat of hydration</b>    | Considerably reduced. 50% min GGBS for large pours                                                   | Considerably reduced. 35% min (50% max) pfa for large pours                                                                            |
| <b>Chloride ion ingress</b> | Very good resistance generally. For severe cases (marine or de-icing salts) 50% min GGBS recommended | Better than OPC but not as good as GGBS. 30% min pfa.                                                                                  |
| <b>Creep</b>                | Lower creep values if cured well.                                                                    | Lower creep values if cured well.                                                                                                      |

<sup>27</sup> WSP (2022) Port Street - Structural Stage 3 Report SJC [Z0-WSP-A180-Rp-XX-0001]

**Table B2 Proposed cement replacement targets<sup>28</sup>**

| Element                                       | Concrete Mix | Percentage GGBS                                                                       |
|-----------------------------------------------|--------------|---------------------------------------------------------------------------------------|
| <b>Tower core foundation</b>                  | 3A           | Up to 60%                                                                             |
| <b>Foundations, ground beams</b>              | 8W/8Z/8D/8C  | 8W/8Z are 20% to 30%<br>8D/8C are CEM1 mixes (0%)<br>These are recently trailed mixes |
| <b>Capping beam</b>                           | 8W/8Z/8D/8C  | 8W/8Z are 20% to 30%<br>8D/8C are CEM1 mixes (0%)<br>These are recently trailed mixes |
| <b>Basement retaining walls</b>               | 16C/16E      | 20%                                                                                   |
| <b>Liner Wall</b>                             | 16C/16E      | 20%                                                                                   |
| <b>Core/shear walls</b>                       | 9B/9C        | 0%                                                                                    |
| <b>Columns</b>                                | 9W/9Z/9B/9C  | 9W/9Z are 20% to 30%<br>9D/9C are CEM1 mixes (0%)<br>These are recently trailed mixes |
| <b>Basement/ Pool Slab</b>                    | 16C/16E      | 20%                                                                                   |
| <b>Ground Floor Slab</b>                      | 8W/8Z/8D/8C  | 8W/8Z are 20% to 30%<br>8D/8C are CEM1 mixes (0%)<br>These are recently trailed mixes |
| <b>Typical upper Slabs, parapet structure</b> | 8W/8Z/8D/8C  | 8W/8Z are 20% to 30%<br>8D/8C are CEM1 mixes (0%)<br>These are recently trailed mixes |
| <b>Level 07/32 Slab</b>                       | 9W/9Z        | 9W/9Z are 20% to 30%                                                                  |

<sup>28</sup> WSP (2022) Port Street - Structural Stage 3 Report SJC [Z0-WSP-A180-Rp-XX-0001]

