Temple Group Ltd

Bishopsgate Goods Yard, Plot 1
Whole Life Carbon Assessment
November 2023

WHOLE LIFE CARBON ASSESSMENT

temple

Prepared for:

Bishopsgate Goodsyard Regeneration Ltd

4th Floor 161 Marsh Wall

London E14 9SJ

Prepared by:

Temple Group

The Clove Building
4 Maguire Street
London
SE1 2NQ

www.templegroup.co.uk

Document Control

Version No.	Date	Authors	Reviewed	Approved
Rev 01	16/11/2023	Maja Radivojevic	Xiangyu Sheng	Charlie Irwin

Contents

Appendices

1.0 Executive Summary

This Whole Life-cycle Carbon Assessment (WLCA) has been produced to respond to the new London Plan (2021) policy SI 2 and following the Greater London Authority's WLCA Guidance. The WLCA supports the reserved matters application for the construction of approximately 58, 263 m2 (GEA) of commercial and retail space constituting Plot 1of the Bishopsgate Goodsyard (the Site). The Proposed Development will sit predominantly within the boundary of the London Borough of Hackney (LBH), with a small section (to the west-east of the plot) in the London Borough of Tower Hamlets.

The key purpose of a WLCA is to identify the sources of greenhouse gas (GHG) emissions (as carbon dioxide equivalents) from across the Proposed Development's whole life-cycle, to enable quantification at an early stage and facilitate consideration as to where and how emissions reductions can be made. This will help contribute to lower GHG emissions and help meet targets set in policy and legislation.

The WLCA has been based on data obtained that is specific to the project, such as the site location, construction activities, material quantities and types, operational energy and water use. These have been provided following a discussion with members of the Project Team, during the pre- application stage of the project. Where particular information was not able to be specified at this stage, assumptions and omissions have been clearly stated.

Building life cycle modules included within the assessment follow those set out in BS EN 15987 and the Royal Institute of Chartered Surveyors Professional Statement 'Whole Life Carbon Assessment for the Built Environment':

- Modules A1-A3. Product stage;
- Modules A4-A5. Construction process stage;
- Modules B1-B7. Use stage;
- Modules C1-C4. End of life stage.

The assessment has followed the principles of BS EN 15978 and has used both the GLA guidance and RICS as the methodology for assessment. This has been facilitated through the use of GLA approved One Click LCA software.

The results of the WLCA are presented as GHG emissions per unit of the development's gross internal area (kg CO2e/m2 GIA), and this has been compared to benchmarked figures stated in the GLA guidance derived from other projects.

The results of the WLCA analysis shows that the Proposed Development is expected to produce **1133 kgCO2e/m2** across its lifecycle (excluding B6, B7, & module D).

This assessment has calculated **866 kg CO2e/m2 GIA** for modules A1-A5, and a further **390 kg CO2e/m2 GIA** for modules B-C (excluding B6 and B7). This is below GLA benchmark provided for office land use, meaning that this scheme is GLA policy compliant.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be **79,165 TCO2e** over 60 years. It should be noted that generic material data has been used for this assessment and using lower embodied carbon material and those with higher recycled content would lead to substantial carbon reductions.

A supporting GLA spreadsheet showing the breakdown of data is provided in **Appendix A** that will also be submitted electronically.

In accordance with the WLCA Guidance, a Post Construction Stage assessment will be undertaken and submitted to the GLA upon commencement of RIBA Stage 6 and prior to the building being handed over. This will be submitted along with any associated evidence.

2.0 Introduction

This report details the Whole Lifecycle Carbon (WLC) Assessment in support of the planning application (2014/2425 (LBH), PA/14/02011 (LBTH)) for the Plot 1 of Bishopsgate Goodyards Development in the London Borough of Hackney and London Borough of Tower Hamlets, which Temple has undertaken on behalf of the Applicant, Bishopsgate Goodsyard Regeneration Limited. This WLC assessment has been prepared in response to the Greater London Authority (GLA) London Plan 2021 Policy SI 2: Minimising Greenhouse Gas Emissions.

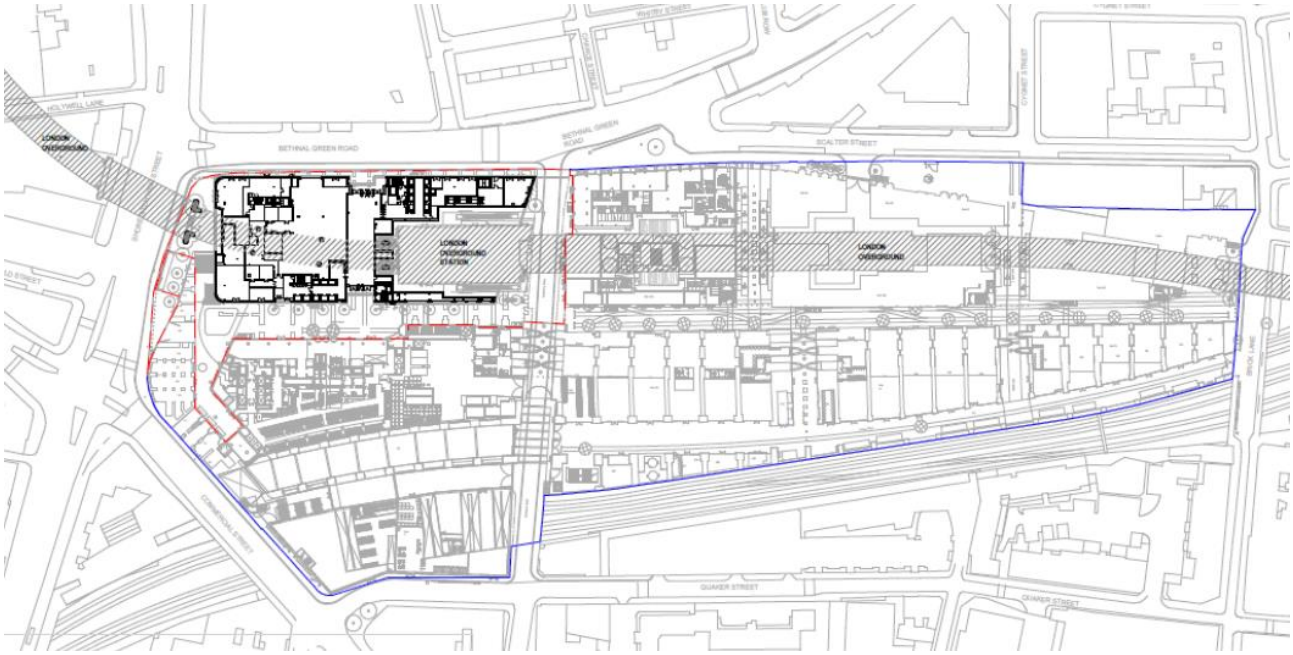
This report outlines measures that will be taken during the design, construction, operational and end of life stages to reduce WLC emissions and their environmental impact. The WLC Assessment should be read in conjunction with the GLA Whole Life Carbon Assessment Template' spreadsheet provided in Appendix A, and the Circular Economy Statement, produced by Temple to account for London Plan 2021 Policy SI 7: Reducing waste and supporting the Circular Economy and submitted alongside this Application.

2.1 Project Description

Bishopsgate Goodsyard Plot 1 is part of an overall masterplan that was granted outline planning consent in 2022. Plot 1 is located to the north-west of the Site predominantly within LBH though also falling across the borough boundary into LBTH. It is bound by Bethnal Green Road to the north and Shoreditch High Street to the west. The raised and concrete-encased London Overground line runs east-west through the centre of this plot.

The Plot 1 Site currently houses temporary uses such as the BoxPark food and retail outlets to the north, the Powerleague sports pitches in the north-west quadrant of the Site and Shoreditch High Street Station. The total area within the red line boundary is approximately 4.4 hectares (Figure 1).

Figure 1 Plan of Site with Plot 1 RMA red line boundary



Plot 1 is circa 58,263 m2 GEA office space and sits in the North-West corner of the site, the footprint of the plot sits over the existing overground Shoreditch Station and its associated tracks.

The office building consists of 12 storeys in the eastern section and 16 storeys in the western section of the building. Seven one storey retail units will be located around the building.

The proposed net internal area (NIA) is 36,679 sqm of office use and 770 sqm of retail use, and the Gross Internal Area (GIA) is 48,222 sqm.

2.2 Assessment Aims

WLC emissions are those that are released from the construction and operation of a building over its entire life, and end-of-life (demolition and disposal). This includes both regulated and unregulated energy use and, and embodied carbon. Embodied carbon emissions are those associated with raw material extraction, manufacture and transport of building materials, construction and the emissions arising from maintenance, repair and replacement as well as dismantling, demolition and disposal. The WLC assessment also assesses any potential 'benefits' from any material reuse or recycling at the end of a building's useful life.

Efforts to decrease operational carbon, accounted for through the National Building Regulations and UK Government and London Mayor's net zero carbon targets, have been successful and now operational emissions are beginning to make up a declining proportion of

a development's carbon emissions. The WLC assessment is required to capture the total carbon impact of a building on the environment.

Calculation and reduction of WLC emissions offers a wealth of benefits including[1]:

- "*Ensuring that a significant source of emissions from the built environment are accounted for which is necessary in achieving a net zero-carbon city;*
- *Achieving resource efficiency and cost savings by encouraging the re-use of existing materials instead of new materials and the retrofit and retention of existing structures and fabric over new construction;*
- *Identifying the carbon benefits of using recycled material and the benefits of designing for future reuse and recycling to reduce waste and support the circular economy;*
- *Encouraging a 'fabric first' approach to building design thereby minimising mechanical plant and services in favour of natural ventilation;*
- *Considering operational and embodied emissions simultaneously to find the optimum solutions for the development over its lifetime;*
- *Identifying the impact of maintenance, repair and replacement over a building's life-cycle which improves life-time resource efficiency and reduces life-cycle costs, contributing to the future proofing of asset value*
- *Encouraging local sourcing of materials and short supply chains, with resulting carbon,* social and economic benefits for the local economy;
- *Encouraging durable construction and flexible design, both of which contribute to greater longevity, reduced obsolescence of buildings and avoiding carbon emissions associated with demolition and new construction."*

2.3 Relevant Legislation, Policies and Guidance

Legislation

2.3.1 Climate Change Act (2008)[2] (2050 Target Amendment) Order 2019

The Climate Change Act 2008 sets up a framework for the UK to achieve its long-term goals of reducing greenhouse gas emissions by 100% by 2050 over the 1990 baseline, amended in

[1] Whole Life-Cycle Carbon Assessments guidance | GLA (london.gov.uk)

[2] Climate Change Act 2008 (legislation.gov.uk)

2019 from 80%. The Act introduces a system of carbon budgeting which constrains the total amount of emissions in a given time period.

National Policy

2.3.2 The National Planning Policy Framework (NPPF)[3]

The NPPF 2019 describes ways in which the challenge of climate change can be met. It states that "new development should be planned for in ways that:

- *" can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."*
-

Regional Policy

2.3.3 The London Plan (2021)[4]

The London Plan from the Greater London Authority (GLA) sets out an integrated economic, environmental, transport and social framework for the development of London. It calls for more sustainable infrastructure and states that "*The Mayor is committed to London becoming a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent*." The following policies are considered relevant to the proposed development:

Policy SI 2 Minimising greenhouse gas emissions

"A - Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

[3] National Planning Policy Framework - Guidance - GOV.UK (www.gov.uk)

[4] The London Plan 2021 | London City Hall

4) be seen: monitor, verify and report on energy performance.

B - Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy

C – A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or

2) off-site provided that an alternative proposal is identified and delivery is certain.

D - Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E - Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F - Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions."

Policy SI7 Reducing waste and supporting the circular economy

"Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration. Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted"

2.3.4 Sustainable Design and Construction SPG, 2014

The guidance in this SPG is intended to:

- *"provide detail on how to implement the sustainable design and construction and wider environmental sustainability policies in the London Plan;*
- *provide guidance on how to develop more detailed local policies on sustainable design and construction;*

- *provide best practice guidance on how to meet the sustainability targets set out in the London Plan; and*
- *provide examples of how to implement sustainability measures within developments."*

Local Policy

2.3.5 Hackney Local Plan 2033 (July 2020)[5]

The London Borough of Hackney's Local Plan 2033 document was adopted in July 2020. It aims to mitigate the impact of climate change and ensure buildings are resilient, as well as energy efficient. The following policies are considered relevant to this document:

LP55 Mitigating Climate Change – Under this policy standards of sustainable construction have been specified:

- All new residential development should meet a zero carbon emissions target emission rate in line with the London Plan energy hierarchy and Sustainability and the Built Environment SPD.
- Where developments cannot meet these requirements on site, they will be required to provide off-site contributions which will be used by the council to deliver equivalent off-setting.

2.3.6 Tower Hamlet Local Plan 2031: Managing Growth and Sharing Benefits[6]

The London Borough of Tower Hamlet's Local Plan 2031 document was adopted in January 2020. The following policies are considered relevant to this Statement:

Policy D.SG4 Planning and construction of new development – Highest standards of sustainable construction should be adopted, including:

- Sustainable construction methods, such as the use of sustainably sourced and recycled materials; and
- The use of demolished material from the development site, where practicable, to minimise the transportation of waste and reduce CO2 emissions.

[5] https://drive.google.com/file/d/1HRu0A_fdoWUi3OBfzUT03TT4S9gYwHDq/view

[6] https://www.towerhamlets.gov.uk/Documents/Planning-and-building-control/Strategic-Planning/Local-Plan/Introduction.pdf

Guidance

2.3.7 Whole Life-cycle Carbon Assessments guidance (2022)[7]

Guidance has been released by the Greater London Authority "*Whole Life-Cycle Carbon Assessments guidance – March 2022*". It outlines how to prepare a WLC assessment which should accompany all referable Planning Applications in line with London Plan Policy SI 2 '*Minimising Greenhouse Gas Emissions'*.

The guidance is accompanied by an assessment template, which provides separate tabs outlining the information that should be submitted at each stage. This template has been provided as a standalone document which should be read in addition to this assessment report.

2.3.8 Royal Institute of Chartered Surveyors (RICS) Whole Life Carbon Assessment for the Built Environment, 2nd edition[8]

The Royal Institute of Chartered Surveyors Professional Statement (referred to hereafter as RICS PS) underpins the British Standard EN 15978, "*providing a consistent whole life carbon assessment implementation plan and reporting structure for built projects, and promoting the reliability of whole life carbon assessments by acting as a solid reference for the industry.' This professional statement is intended to standardise whole life carbon assessment and enhance consistency in outputs, by:*

- *providing specific practical guidance for the interpretation and implementation of the methodology in EN 15978 in carbon calculations. This is to achieve coherent and comparable results that can be used to benchmark the whole life carbon performance of built assets. The specific objectives of this professional statement are to:*

    a) *provide a consistent and transparent whole life carbon assessment implementation plan and reporting structure for built projects in line with EN 15978*

    b) *enable coherence in the outputs of whole life carbon assessments to improve the comparability and usability of results*

    c) *make whole life carbon assessments more 'mainstream' by enhancing their accessibility and therefore encourage greater engagement and uptake by the built environment sector*

    d) *increase the reliability of whole life carbon assessment by providing a solid source of reference for the industry*

[7] https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance

[8] file:///C:/Users/Maja.Radivojevic/Downloads/Whole_life_carbon_assessment_PS_Sept23%20(6).pdf

e) promote long-term thinking past project practical completion, concerning the maintenance, durability and adaptability of building components and the project as a whole; and

f) promote circular economic principles by encouraging future repurposing of building components, as well as of the project as a whole, through quantify."

As a minimum, the RICS PS requires the WLCA to be carried out before the commencement of the technical design (RIBA Stage 4 or equivalent) of the project.

2.3.9 Net Zero Whole Life Carbon Roadmap[9]

The UK Green Building Council (UKGBC) are developing a national whole life carbon roadmap, to build common actions to achieve net zero carbon within the construction, operation and demolition of buildings and infrastructure.

The project will consist of two main elements, developing a science-based trajectory for the reduction of emissions arising from the built environment sector, in line with limiting global temperature rise to below 1.5 degrees, and the production of a report detailing industry actions, government policies and associated mechanisms and process to manage the transition to net zero.

2.3.10 London Energy Transformation Initiative – Climate Emergency Design Guide[10]

The London Energy Transformation Initiative (LETI) is a network of over 1,000 built environment professionals that are working together to put the UK on the path to a zero carbon future. The voluntary group is made up of developers, engineers, housing associations, architects, planners, academics, sustainability professionals, contractors and facilities managers, with support and input provided by the GLA and London boroughs.

2.3.11 London Energy Transformation Initiative – Embodied Carbon Primer[11]

The LETI Embodied Carbon Primer offers supplementary guidance to the Climate Emergency Design Guide and is intended to provide designers including architects, engineers, interior designers and urban designers with easy-to-follow best practice and toolkits for reducing embodied carbon in buildings.

In addition, the following guidance are available to conduct assessments:

- BS EN 15978:2011 - Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method.

[9] https://www.ukgbc.org/ukgbc-work/net-zero-whole-life-carbon-roadmap/

[10] https://www.leti.uk/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

[11] https://www.leti.uk/_files/ugd/252d09_8ceffcbcafdb43cf8a19ab9af5073b92.pdf

- ISO 14040:2006 - Environmental management — Life cycle assessment — Principles and framework.

2.4 Methodology

This assessment calculates WLC emissions in line with the draft guidance published by the GLA and the RICS PS 'Whole Life Carbon Assessment for the Built Environment 2017'.

The two metrics (operational and embodied) and the additional life cycle stages, which include demolition, end of life and refurbishment/replacement cycles, have been included in this WLC assessment.

2.4.1 Study Period

The reference study period (RSP) is 60 years, this is based on the principles outlined in BS EN 15978: 2011, section 7.3 and the RICS guidance. RSPs are fixed to enable comparability between whole life carbon results for different projects. It ensures that the assessment is representative of typical service life of different building elements.

2.5 Operational Carbon

Operational energy refers to the total energy input required for heating and power within a building. The assessment considers both regulated and unregulated emissions, following the Government's approved methodology for Building Regulations Part L compliance, specifically using the Dynamic Simulation Model (DSM) for non-residential units.

To evaluate the design of the Bishopsgate Goodsyard Building, simulation models were generated. The estimated energy demand for commercial and office units was determined using the Integrated Environmental Virtual Environment (IESVe) software, applying the National Calculation Method (NCM 2021 Edition). IESVe calculates regulated energy demands associated with hot water, space heating, and fixed electrical items, as well as unregulated energy demands.

2.6 Embodied Carbon

2.6.1 One Click LCA

Temple utilised the OneClick LCA tool for conducting the Whole Life Cycle (WLC) assessment. This online Building Life-Cycle Assessment software, developed by the Helsinki-based company Bionova, is widely adopted in the development and construction industry. It is recognized by the Greater London Authority (GLA) and comes with integrated access to extensive local and

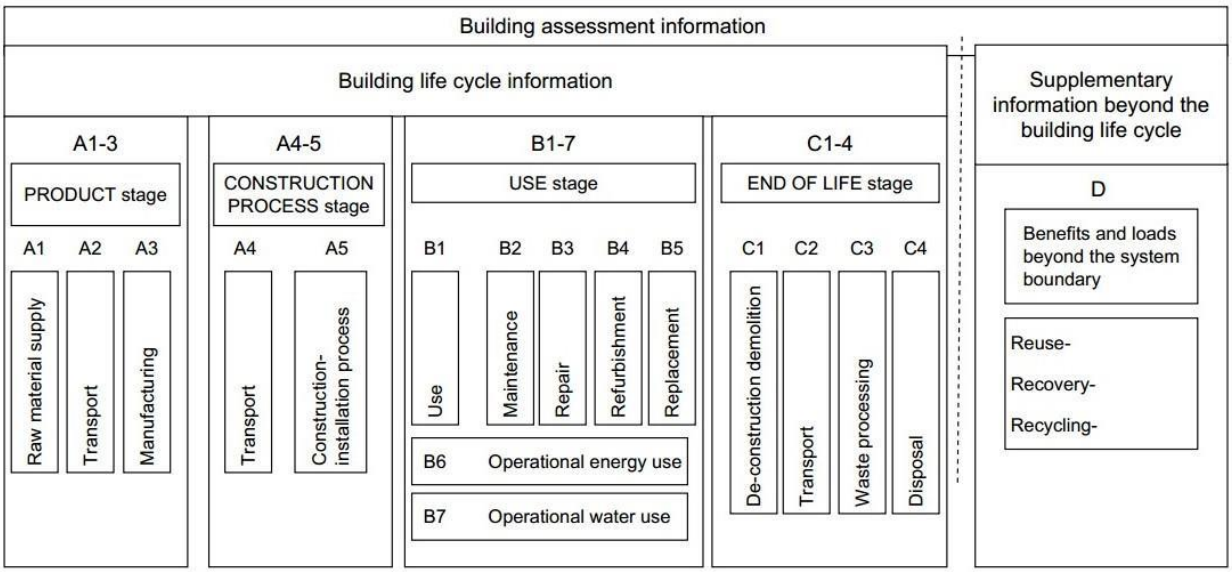
global Environmental Product Declaration (EPD) databases. For each material, the most suitable option available in the OneClick database was selected.

2.6.2 Approach and Benchmarks

Nationally recognised assessment methodology must be used for the WLC assessment, namely BS EN 15978: 2011; (Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method), which sets out principles and calculation method and is underpinned by the RICS PS. To maintain compliance with Policy SI 2 of the London Plan, the assessment must be in line with the stated documents.

BS EN 15978 and the RICS PS categorise the life of a typical project into life cycle modules, shown in Figure 2.

Figure 2 Whole lifecycle modules



- Product (module A1 – A3) and construction stages (module A4 – A5): The product stage includes the carbon emissions arising during the extraction of raw materials from the earth, transportation to manufacturing facility/facilities and the energy used for

manufacturing into construction materials. The transportation to site, and construction of the materials into buildings make up the construction stage;

- In-Use Stages (module B1 – B5): Quantifies emissions arising from the operational water and energy usage and the embodied carbon associated with any maintenance, repair, replacement and refurbishment required;
- End of Life Stages (module C1 – C5): This covers the deconstruction and/or demolition of the building, accounting for the on-site activity of the demolition contractors and the transportation to waste processing before eventual disposal;
- Reuse, Recycle, Recover (module D): Encompasses any carbon costs or benefits achieved through any reuse, recycling or recovery potential. Carbon reduction measures will be including in the separate Circular Economy Statement.

To comply with Policy SI 2, the WLCA must cover the entirety of modules A to D, presenting the modules separately, with a reference study period of 60 years. All life-cycle stages detailed within the EN 15978 cradle-to-grave system boundary approach have been included within this assessment.

Benchmarking

A set of WLC benchmarks have been developed by the GLA in which applicants are required to compare against their own results as part of the assessment and which the GLA will refer to in its review of these assessments. These benchmarks, integral to the GLA's evaluation process, are derived from assessments conducted for previous projects that adhered to the RICS PS in terms of scope, material baseline assumptions, and specifications. All life-cycle modules apart from B6, B7 (operational energy and operational water) and module D are included. Additionally, an "aspirational" set of benchmarks has been formulated for applicants seeking to surpass standard expectations, reflecting a 40% reduction in WLC emissions compared to the initial benchmarks. Both sets of benchmarks are included in this assessment and are being reported on.

To reflect the Proposed Development's land use, the benchmarks for office use are shown in Table 1.

Table 1 GLA Benchmark values for office use[12]

Module	Benchmark (kg CO2e/m2 GIA)	Aspirational Benchmark (kg CO2e/m2 GIA)
A1-A5 (excluding sequestration)	<950 kg CO2e/m2 GIA	<600 kg CO2e/m2 GIA
B – C (excluding B6 & B7)	<450 kg CO2e/m2 GIA	<370 kg CO2e/m2 GIA
A-C (excluding B6 & B7, including sequestration)	<1400 kg CO2e/m2 GIA	<970 kg CO2e/m2 GIA

Comparison against the benchmark provides an initial indication of the performance of Proposed Development against current industry average. An overview of the modules is described below:

2.6.3 Data Sources, Assumptions and Omissions

The assessment has utilised multiple data sources and is based on the level of detail available at the current stage of design. The following data sources have been used:

The following data sources were used in the LCA model:

- Material types and quantities from the Project Team, broken down by RICS PS categories;
- Database OneClick LCA material/component databases;
- Relevant plans, sections, elevations and specifications from the Project Team.

Approach for WLC Assessment was discussed with members of the Project Team. Separate discussions were undertaken with the specialists producing the Energy Strategy, which has informed this document.

As this is a reserved matters planning application, a degree of accuracy is assumed within the data provided. However, at this stage a Contractor has not been appointed and so there is a limitation with regards to the precise specifications of some of the materials and construction

[12] Whole Life-Cycle Carbon Assessments guidance | GLA (london.gov.uk)

strategies to be used. Where required, assumptions have been made based upon professional judgement and reference to other similar schemes for which data is available. It is anticipated that all uncertainties will be resolved at the third stage of the WLCA, following construction and based upon as built data. This data can feed back into the growing body of evidence and be used to provide more accurate basis of assumptions in future assessments.

Product stage

OneClick's extensive LCA database of building materials was used to calculate the emissions of the product used. The project Cost Plan (produced by Gardiner & Theobald, February 2023) has been used to provide an itemised list of materials and quantities, and in accordance with RICS PS 'generic' environmental profiles have been allocated to materials where product details are not specified at this stage.

As per the RICS PS the reference study period (RSP) is 60 years, which aligns with the operational design life of 60 years. The functional unit for the assessment is kgCO2e/m2 GIA. Different materials have different functional life spans, although this is discussed under the use stage modules B1-B5 below.

Demolition

RICS guidance acknowledges that "Demolition works are often decoupled from new construction projects, hence the responsibility for any emissions arising from demolition is not necessarily solely attributable to the new build project". As stated within the guidance "New build projects assessed are considered to commence their development on a cleared, flat site for consistency purposes." [8]

Accordingly, this is the approach taken for this assessment.

Construction stage

Construction activities have been assumed based on geographic location of the project and building area to calculate electricity, fuel, waste and transportation impacts of the development's construction. This is calculated using an algorithm within the OneClick software.

In addition to embodied carbon in the materials used for construction, greenhouse gas (GHG) emissions will be created by transportation of materials to site and operation of onsite plant and machinery. Guidance from RICs indicates 1.4 tonnes of CO2e per £100,000 of project value, this is further referenced and approved by the BRE. The project value has been provided by the Applicant, which has allowed the construction transport GHG emissions to be included.

Use stage

Service life of building materials was kept as default for the majority of material choices. This means that if its service life is 10 years (for example), then it will need to be replaced 5 times during the standard 60-year lifespan. Maintenance emissions have been calculated at 10kgCO2/m2, as per GLA guidance, and repair and refurbishment emission were based on GLA guidance which assumes that these emissions make up 25% of the total maintenance emissions for the site.

Operational energy demands (B6) have been based on the Energy Strategy which was produced in support of this planning application to demonstrate compliance with London Plan 2021 Policy SI2.

The carbon impact associated with water use during the operation of the proposed development is also required to be reported, in accordance with the RICS guidance. Water consumption was obtained by multiplying intended full occupancy of the development with annual water consumption.

Vegetation carbon withdrawal has been included in the WLC assessment and estimated based on the number of trees reported in the tree plan. However, when reporting the results for Modules A1 – A5, the sequestered carbon has been excluded.

End-of-life stage and beyond the life cycle

Emissions from deconstruction are calculated within the OneClick software based on the known parameters of the building and its location.

Benefits and loads beyond these modules (the system boundary) are considered in the Circular Economy Statement accompanying this WLCA and supporting the planning application.

The following table outlines the assumptions made within this WLCA assessment:

Table 2: WLCA Assumptions

Data	Data Source
Material types and volumes (A1-A3)	Material types were provided by the design team in a form of a cost plan. At least 99% of the cost allocated to each building element category has been accounted for in the assessment.
Transport data (A4)	Default values provided by One Click.
Construction site operations (A5)	Waste estimates were provided by the Applicant.
Refrigerant Use (B1)	Refrigerant quantity has been estimated based on the assumption that most widely used refrigerant R32 will be used within the Air Source Heat Pumps with average annual leakage of 2% and 1% end of life leakage rate with a 99% end of life recovery (as per CIBSE TM65).
Maintenance (B2)	B2 emissions have been calculated at 10kgCO2/m2, as per GLA guidance.
Repair and Replacement data (B3-B4)	An assumption has been made based on GLA guidance that assumes B3 emissions are 25% of the total B2 emissions for the site. Default values provided by RICS and One Click EPD database for products inputted into software for B4 emissions.
Refurbishment (B5)	At present One Click Tool does not have ways to consider B5 emissions. However, based on the information provided for B3 and B4 it is likely that these emissions have been accounted for.
Operational energy (B6)	Energy calculations based on DSM calculations from the Energy Strategy by Hoare Lea (September 2023).
Operational water (B7)	Water consumption provided by the applicant (105 l/pp/d) and multiplied by the intended full occupancy.
End of life (C1-C4)	Default values provided by One Click based on the information within the EPD database.
Building areas	Plot 1 – 58, 263 m2 (GEA), 48,222m2 (GIA)
Assessment period	60 years

3.0 Whole Life-cycle Carbon Assessment

3.1 Design Stage Assessment Results

As noted above, this is an initial assessment based on the best available information which will need to be updated as the project progresses in line with GLA requirements.

The results when compared to the GLA benchmark values, as noted in the GLA guidance note "Whole Life-Cycle Carbon Assessments guidance – March 2022" are shown in **Table 3** below, in kgCO2e per square meter of the GIA:

Table 3 Whole Life-cycle Carbon emissions model breakdown

Module	Plot 1, Bishopsgate Goodsyard	WLC Benchmark	Aspirational Benchmark
A1-A5 (excluding sequestration)	**866 kg CO2e/m2 GIA**	<950 kg CO2e/m2 GIA	<600 kg CO2e/m2 GIA
B – C (excluding B6 & B7)	**390 CO2e/m2 GIA**	<450 kg CO2e/m2 GIA	<370 kg CO2e/m2 GIA
A-C (excluding B6 & B7, including sequestration)	**1133 kg CO2e/m2 GIA**	<1400 kg CO2e/m2 GIA	<970 kg CO2e/m2 GIA

It must be noted that no benchmark has been set by the GLA for operational and energy use (life cycle stages B6-B7). The results for these have therefore been omitted from the totals in the Table above.

The WLC emissions, arising from the Proposed Development total to **1133 kgCO2e/m2 GIA.** This is broken down as:

- **866 kgCO2/m2** for modules A1-A5 (excluding sequestered carbon).
- **390 kgCO2/m2** for modules B-C.

The full results , which include emission from B6 and B7 lifecycle stages are as follows:

Table 4 Full WLCA results

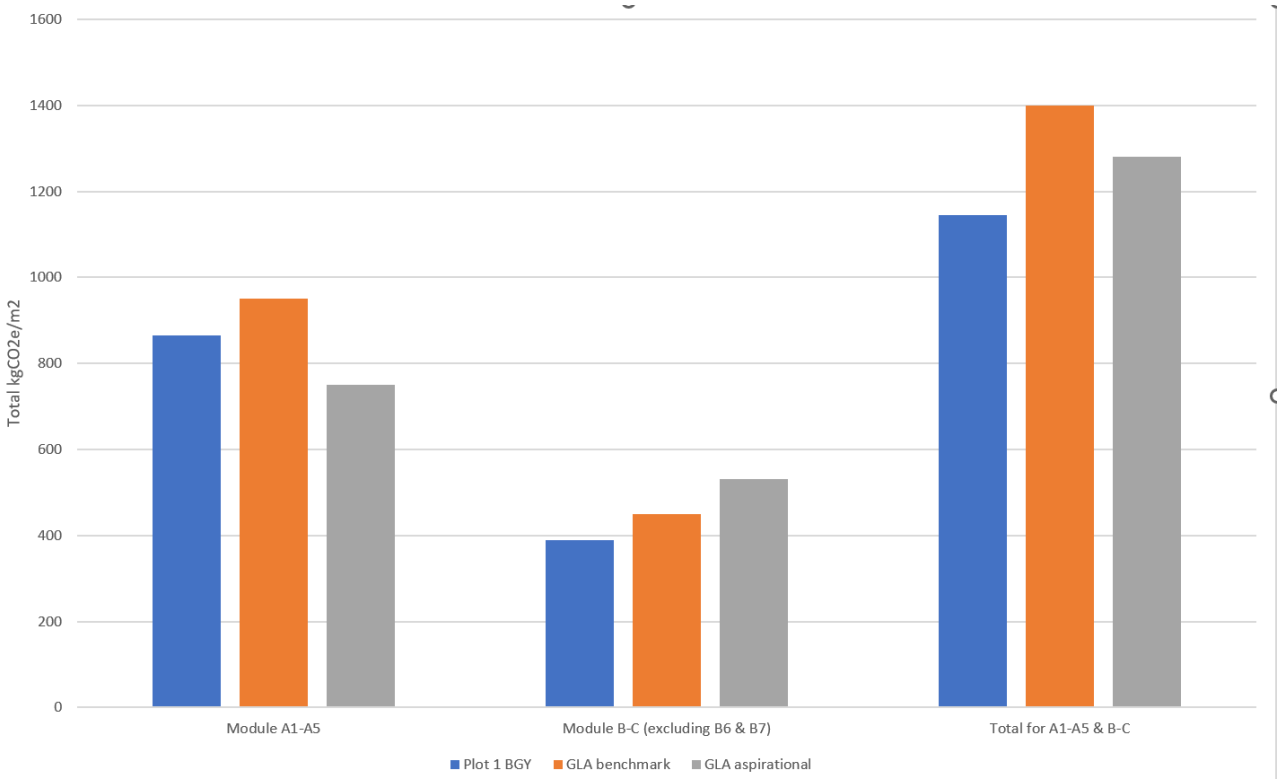
Module	Category	Total kg CO2e over 60 years	Total kgCO2e/m2 GIA over 60 years (GIA=48,222 m²)
A1-A3	Construction materials	36,453,872	755
A4	Transport	653, 981	13
A5	Site Operations	4,629,850	96
B1	In Use	9,317	0.2
B2	Maintenance	483,606	10
B3	Repair	120,901	2.5
B4	Replacement/Refurbishment	11,738,428	243
B6	Operational Energy Use	18,745,936	388
B7	Operational Water Use	5,760,248	119
C1-C4	End of Life	6,592,443	136
	Total	84, 534, 601	1753
	Carbon sequestration	-5,369,504	-111
	Total	**79,165, 097**	**1,641**
	Total A-C (excluding B6 & B7)	54, 658,913	1133

The above results demonstrate that 54,658 tonnes of CO2e are expected to be emitted over a 60-year period, or 1,133 kgCO2e/m2 when B6 and B67 emission are not considered.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be 79,165 TCO2 over 60 years.

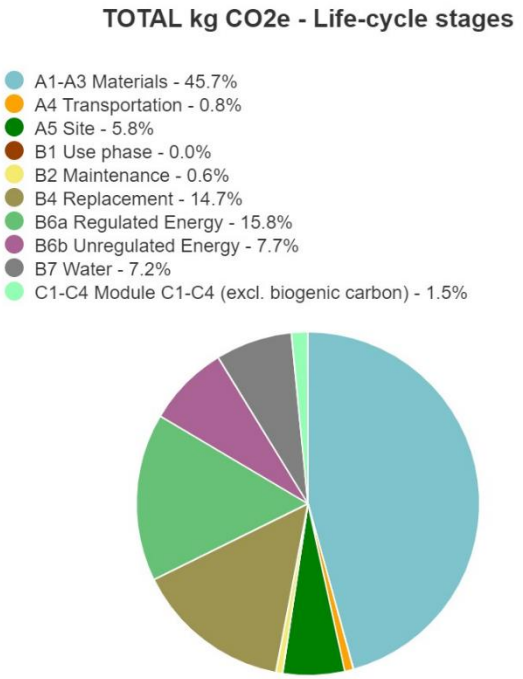
The expected WLC results are lower than the GLA WLC Benchmark for all modules. This demonstrates that Proposed Development at Plot 1 of Bishopsgate Goodsyard has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available, as shown in **Figure 3.**

Figure 3 Total kgCO2 /m2 Gross Internal Floor Area (GIA) performance compared to GLA Benchmarks



As shown in **Figure 4**, the highest proportion of emissions arise from modules A1-A3, with the embodied carbon making up 45.7 % of the total. By practical completion, (A1-A5), 52.3 % of the emissions will be released, with 46% being emitted during use (B), and 1.5 % at the end of the building life (C). In **Table 5**, module D is shown as negative values. This is because materials can be recycled or reused, releasing less emissions than if virgin materials were to be used.

Figure 4 Emissions released across Life-cycle modules



3.2 Embodied Carbon Breakdown

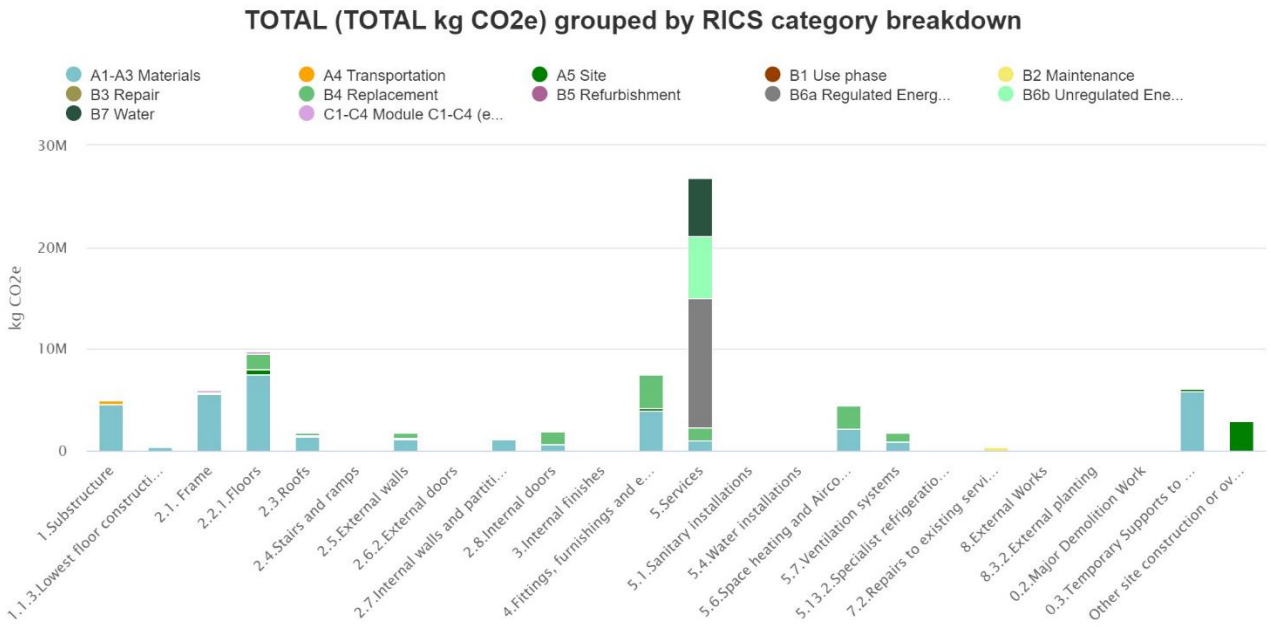
Table 5 and **Figure 5** display emissions at the different RICS building element categories. Again, it can be seen that the majority of the emissions originate from the embodied carbon of materials.

The substructure, and superstructure (frame and upper floor) and service installations contain a large proportion of steel, while the floor finishes incorporate screed composed of cement. The production process for both cement and steel are carbon- intensive, contributing significantly to the overall embodied carbon value.

Table 5 Emission breakdown by life-cycle module and building element

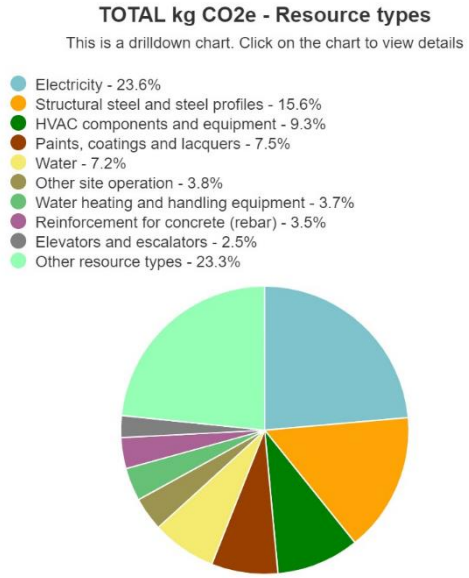
	Carbon at completion (module A1-A5) (Tonnes)	Carbon over lifecycle (B2-B5) (Tonnes)	Carbon over lifecycle (C1-C4) (Tonnes)	Whole Life Carbon (Tonnes)	Carbon over lifecycle (D) (Tonnes)
Substructure	5,562	0	145	5,707	-1,998
Superstructure	18,517	3,588	1,848	23,953	-18,400
Finishes	78	164	53	295	-0.14
Fittings, furnishings and equipment	4,203	3,300	4,203	11706	-1,509
Services (MEP)	4,158	4,561	36	8,755	-3,171
External works	90	194	78	362	-216
Other site construction	2,967	535		3,502	
Total tonnes CO2	35,575	12,342	6363	54,280	-28,772
Total kg CO_2/m^2 GIA	738	256	132	1,125	-591
				Total tonnes CO2 (inc module D)	26,127
				Total kg CO_2/m^2 GIA (inc module D)	534

Figure 5 Elemental emission breakdown



Represented in Figure 6, structural steel, HVAC components, electricity and paint account for 56 % of the total whole life emission calculated within this assessment. Generic data has been used, as at the timing of this writing this report, as the exact material types are not known.

Figure 6 CO_2 emissions from resource type



4.0 Carbon mitigation measures

The proposed development prioritises sustainability and the reduction of whole-life carbon by incorporating thoughtful measures throughout the design stage. Lean design principles will be applied to minimize the quantities of concrete used, and the concrete composition will optimize Ground Granulated Blast-furnace Slag (GGBS) content for its lower embodied carbon, resulting in reduced A1-A3 emissions.

Moreover, operational carbon emissions (B6 and B7) will be significantly decreased by up to 35% compared to the Part L 2013 baseline. This reduction will be achieved through National Grid decarbonisation plan and through implementation of passive design measures, energy efficiency initiatives, and integration of air source heat pumps (ASHP), aligning with the GLA policy outlined in the Energy Planning Guidance.

Reduce material use

Further measures concern future demolition and deconstruction of the development which could be considered at the design stage. Consideration to be given to ways to facilitate dismantling, where possible.

Management of construction and municipal waste arisings from the development have been explored within the Circular Economy Statement. Please refer to the report for full details.

Recycled materials

The use of recycled content and secondary aggregates will be encouraged and given priority, reducing the demand for virgin material and optimising material efficiency in construction. The design has taken in to account the reuse of reprocessed material from the site, e.g., recycled aggregates, timber, or masonry. More details can be found in the Circular Economy Statement.

Reuse of material

The Circular Economy statement details the strategy for recovery and reuse of materials. Please refer to the report for further detail.

Sustainable Procurement

The transportation of materials from the manufacturing facility to the building site adds to the carbon of the development. Preference will be given to the use of local sources and suppliers whenever possible and commercially viable to reduce ‘transport miles” and help reduce the emissions produced during transportation. This review would impact life cycle A4 - emissions from transportation to site.

5.0 Conclusions

The WLC assessment of Plot 1 has highlighted that the embodied material carbon, life-cycle stages A1-A3, are the main emission sources. Managing the supply chain and opting for local products will reduce the transportation related emissions. Consideration has also been given to the use of recycled materials and materials with low environmental impact. Furthermore, sustainable waste management practices which will be promoted during both excavation, construction and demolition phases of the Proposed Development, will help reduce emissions even further. Considering WLC at the design stage gives guidance to the project team upon which materials selection or products will offer the most efficiency depending on their lifetimes, as well as support material circularity, decreasing end of life emissions too.

The kg CO2e/m2 GIA values are displayed in Table 3. This assessment has calculated that the Proposed Development falls below the 950 kg CO2e/m2 GIA benchmark given by the GLA for modules A1-A5, below 450 CO2e/m2 GIA benchmark for modules B and C, and achieves a total A-C emissions value below the aspirational GLA benchmark at 1133kg CO2e/m2 GIA. Consequently, the development is fully compliant with GLA policy. This demonstrates that for the Development situated in Plot 1 the relevant policy has been taken into account and emissions have been reduced as far as reasonably possible based on current information available.

A series of high-level opportunities to further reduce carbon emissions post planning have also been proposed. These measures will be looked at in detail in the next stage of the design development process and included, where possible.

Following RIBA stage 6, at the post construction stage, the WLC assessment will be updated and submitted to the GLA using real monitored data from the finished Proposed Development.

Appendix 1: Completed GLA spreadsheet

Project details				
Project name	Bishopsgate Goodsyard, Plot 1. LBH. LBTH			
Planning application reference number (if applicable)	2014/2425 (LBH), PA/14/02011 (LBTH)			
Use type	e.g. A1, B1 etc.			
Brief description of the project	Construction of the office building. 12 storeys in the eastern section and 10 storeys in the western section of the building.			
GIA (m²)	61,000 sqm			
Author (organisation or individual)	[illegible]			
Date of assessment	12 October 2023			
Nationally recognised assessment method used	BS EN 15978, with additional guidance from RICS Professional Statement and GLA Whole Life Carbon Assessment Guidance			
Reference study period (if not 60 years)	assumed building life expectancy exceeds 100 years.			
Software tool used	OneClick LCA			
Source of carbon data for materials and products	[See guidance for acceptable sources]			
EPD database used	OneClickLCA, IBU, INIES, international EPD system, European aluminium, EPD Denmark, MRPI, OKOBAUDAT, BRE, RTS. All EU databases included complying with the EN 15804 standard and North-American databases comply with the ISO 14040/44 standard.			

Estimated WLC emissions (Assessment 1)
N.B. This forms the WLC baseline for the development. The results from Assessment 1 below are automatically populated here.

	Module A1-A5	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO_2e	33,400,230 kg CO2e	12,352,252 kg CO2e	24,506,183 kg CO2e	6,592,443 kg CO2e	-28,507,770 kg CO2e
TOTAL kg CO_2e/m^2 GIA	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Comparison with WLC benchmarks (see Appendix 2 of the guidance) if Assessment 1 was used to inform design decisions	[Explain the reasons for any divergences from WLC benchmarks, including against the WLC aspirational benchmarks]				

Estimated WLC emissions (Assessment 2)
N.B. The results from Assessment 2 below are automatically populated here.

	Module A1-A5	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO_2e	33,400,230 kg CO2e	10,819,260 kg CO2e	0 kg CO2e	6,592,443 kg CO2e	############
TOTAL kg CO_2e/m^2 GIA	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Comparison with WLC benchmarks (see Appendix 2 of the guidance) if Assessment 2 was used to inform design decisions	[Explain the reasons for any divergences from WLC benchmarks, including against the WLC aspirational benchmarks. Please note that grid decarbonisation has not been accounted for in the benchmarks]				

Key site opportunities and constraints in reducing WLC emissions	

Summary of key actions to reduce whole life-cycle carbon emissions that have informed this assessment, including the WLC reductions	Action	WLC reduction (kg CO_2e/m^2 GIA)
	Development of a well connected site, to facilitate increased density and a more efficient use of land.	embedded mitigation
	Consideration of circular economy principles to reduce waste and minimise resource use (see accompanying CE statement)	
	Following of the GLA's energ hierarchy and adopting a fabric first approach to operational energy efficiency	
	Application of Energy Strategy (particularly use of	embedded mitigation
	Roof mounted photovoltaics	embedded mitigation

Specify further opportunities to reduce the development's whole life-cycle carbon emissions, including the WLC reduction potential	Further potential opportunities	WLC reduction potential (kg CO_2e/m^2 GIA)

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
Note/example		Breakdown of material type in each category [Insert more lines if needed] e.g. Concrete		For all primary building systems (structure, substructure, envelope, MEP services, internal finishes)	Declare 'end of life' scenario as per project's Circular Economy Statement		
0.1	Demolition: Toxic/Hazardous/Contaminated Material Treatment	N/A					
0.2	Major Demolition Works	N/A					
0.3	Temporary Support to Adjacent Structures	N/A					
0.4	Specialist Ground Works	N/A					
1	Substructure	Ready-mix concrete (coumns, piling, slabs)	16,696,207 kg				
		Reinforced concrete (piling, slab, column)	8,845,842 kg				
		Precast concrete (ground beam)	1,287,770 kg				
		Secant pile wall	370,000 kg				
		Clay soil	53,867,972 kg				
		Formwork	1,587,415 kg				
		Attenuation tank	24,000 kg				
		Reinforcement steel	948,283 kg				
		Waterproofing membrane	3136 kg				
2.1	Superstructure: Frame	Steel	5,285,427 kg				
		Precast concrete	196,020 kg				
		Concrete for masonry	30,018 kg				
		Reinforcement steel	640,000 kg				
		Formwork and insulation	4,518,303 kg				
2.2	Superstructure: Upper Floors	Structural steelwork	5,225,000 kg				
		Reinforcement steel	36 kg				
		Concrete (flooring	14,739,110 kg				
		Recycled surface finishing	1,400,000 kg				
		Galvanized steel	570,000 kg				
		Intumescent paint	434,000 kg				
2.3	Superstructure: Roof	Waterproofing system	18,500 kg				
		Reinforced steel	745,611 kg				
		Concrete (slab)	2,148,000 kg				
		Intumescent Paint	240,000 kg				
		Stainless Steel	12,236 kg				
		Structural Steel	239,000 kg				
		Wood construction	10 kg				
		Green roof system	48,000 kg				
2.4	Superstructure: Stairs and Ramps	Precast concrete	121,830 kg				
2.5	Superstructure: External Walls	Aluminium (curtain walling, façade)	25,140 kg				
		Concrete cladding system	1,043,641 kg				
		Terracotta bricks	110,000 kg				
2.6	Superstructure: Windows and External Doors	Revolving door	1,800 kg				
		Other external doors	22,094 kg				
		Reinforced concrete	10,466,400 kg				
		Almium composite panel	35,872 kg				
2.7	Superstructure: Internal Walls and Partitions	Concrete masonry brick	9,644,400 kg				
2.8	Superstructure: Internal Doors	Wood (doors)	626,886 kg				
3	Finishes	Coating	260 kg				
		Tiles (floors, walls)	59,099 kg				
		Anti-corrosive paint	2,900 kg				
4	Fittings, furnishings & equipment (FFE)	Stainless Steel	500 kg				
		Wood	2,700,000 kg				
		Sheet metal	5,929 kg				
		Services fit out elements	358,800 kg				
		Floor panels	460,000 kg				
5	Services (MEP)	Alarm system	220 kg				
		Sanitary ware (stainless steel)	969 kg				
		Sanitary ware (ceramics)	8,800 kg				
		Electric elevator elements	115,782 kg				
		Ventilation, heat, electricty, watewater, freshwater system	200,000 kg				
6	Prefabricated Buildings and Building Units						
7	Work to Existing Building						
8	External works	Plastic pipework	2,688 kg				
		Loading dock component	34,000 kg				
		TOTAL	34,268,084 kg			0 kg	0 kg
		Material intensity (kg/m2 GIA)	#VALUE!			#VALUE!	#VALUE!

Confirm here whether Assessment 1 or Assessment 2 (see below) is to form the basis of design decisions	

ASSESSMENT 1 - current status of the electricity grid

GWP POTENTIAL FOR ALL LIFE-CYCLE MODULES[1] (kgCO2e)		Sequestered (or biogenic) carbon (negative value) (kgCO2e)	Product stage (kgCO2e)	Construction process stage (kgCO2e)		Use stage (kgCO2e)							End of Life (EoL) stage (kgCO2e)				TOTAL Modules A-C kgCO2e	Benefits and loads beyond the system boundary (kgCO2e)
			Module A			Module B							Module C					
Building element category			[A1] to [A3]	[A4][2]	[A5]	[B1]	[B2]*	[B3]*	[B4]*	[B5]*	[B6]	[B7]	[C1]	[C2]	[C3]	[C4]		Module D*
0.1	Demolition: Toxic/Hazardous/Contaminated Material Treatment												############				163,955 kg CO2e	
0.2	Major Demolition Works																0 kg CO2e	
0.3	Temporary Support to Adjacent Structures		5,819,368 kg CO2e	22,604 kg CO2e	320,707 kg CO2e									58,036 kg CO2e	3,068 kg CO2e	3,593 kg CO2e	6,227,375 kg CO2e	-3,210,394 kg CO2e
0.4	Specialist Ground Works																0 kg CO2e	
0.5	Temporary Diversion Works																0 kg CO2e	
1	Substructure	0 kg CO2e	4,957,745 kg CO2e	447,285 kg CO2e	156,530 kg CO2e									126,289 kg CO2e	18,965 kg CO2e		5,706,814 kg CO2e	-1,998,218 kg CO2e
2.1	Superstructure: Frame	0 kg CO2e	5,538,245 kg CO2e	34,799 kg CO2e	188,397 kg CO2e									239,432 kg CO2e	14,356 kg CO2e	125 kg CO2e	6,015,354 kg CO2e	-3,646,417 kg CO2e
2.2	Superstructure: Upper Floors	0 kg CO2e	7,485,580 kg CO2e	66,997 kg CO2e	441,200 kg CO2e				1,533,788 kg CO2e					272,892 kg CO2e	18,331 kg CO2e	1,128 kg CO2e	9,819,917 kg CO2e	-13,921,345 kg CO2e
2.3	Superstructure: Roof	-8,612 kg CO2e	1,452,129 kg CO2e	12,536 kg CO2e	108,158 kg CO2e				159,607 kg CO2e					42,088 kg CO2e	49,625 kg CO2e	638 kg CO2e	1,816,169 kg CO2e	-306,085 kg CO2e
2.4	Superstructure: Stairs and Ramps	0 kg CO2e	18,297 kg CO2e	280 kg CO2e	0 kg CO2e									357 kg CO2e	42 kg CO2e		18,976 kg CO2e	-5,372 kg CO2e
2.5	Superstructure: External Walls	0 kg CO2e	1,151,401 kg CO2e	15,297 kg CO2e	85,939 kg CO2e				483,530 kg CO2e					15,787 kg CO2e	1,262 kg CO2e	539 kg CO2e	1,753,754 kg CO2e	-282,372 kg CO2e
2.6	Superstructure: Windows and External Doors	-172 kg CO2e	131,937 kg CO2e	121 kg CO2e	0 kg CO2e				141,996 kg CO2e					912 kg CO2e	249 kg CO2e	7 kg CO2e	275,050 kg CO2e	-80,402 kg CO2e
2.7	Superstructure: Internal Walls and Partitions	0 kg CO2e	1,081,691 kg CO2e	22,159 kg CO2e	56,770 kg CO2e									28,221 kg CO2e	3,336 kg CO2e		1,192,177 kg CO2e	-158,896 kg CO2e
2.8	Superstructure: Internal Doors	-1,149,291 kg CO2e	622,402 kg CO2e	3,121 kg CO2e	0 kg CO2e				1,269,395 kg CO2e					2,401 kg CO2e	1,155,739 kg CO2e	326 kg CO2e	1,904,092 kg CO2e	
3	Finishes	0 kg CO2e	65,379 kg CO2e	243 kg CO2e	11,893 kg CO2e				163,565 kg CO2e					205 kg CO2e	53,091 kg CO2e	8 kg CO2e	294,384 kg CO2e	-143 kg CO2e
4	Fittings, furnishings & equipment	-4,134,544 kg CO2e	3,929,677 kg CO2e	17,698 kg CO2e	255,220 kg CO2e			120,901 kg CO2e	3,300,023 kg CO2e					32,287 kg CO2e	4,170,646 kg CO2e	381 kg CO2e	7,692,287 kg CO2e	-1,509,273 kg CO2e
5	Services (MEP)	0 kg CO2e	4,110,717 kg CO2e	10,500 kg CO2e	36,568 kg CO2e	9,317 kg CO2e	59,805 kg CO2e		4,492,520 kg CO2e		12,591,729 kg CO2e 6,154,207 kg CO2e	5,760,248 kg CO2e		32,392 kg CO2e	3,040 kg CO2e	213 kg CO2e	33,261,254 kg CO2e	-3,171,994 kg CO2e
6	Prefabricated Buildings and Building Units																0 kg CO2e	
7	Work to Existing Building						423,801 kg CO2e										423,801 kg CO2e	
8	External works	-76,885 kg CO2e	89,304 kg CO2e	343 kg CO2e	500 kg CO2e				194,005 kg CO2e					1,395 kg CO2e	77,077 kg CO2e	10 kg CO2e	285,748 kg CO2e	-216,858 kg CO2e
	TOTAL kg CO2e	-5,369,504 kg CO2e	36,453,872 kg CO2e	653,981 kg CO2e	1,661,880 kg CO2e	9,317 kg CO2e	483,606 kg CO2e	120,901 kg CO2e	11,738,428 kg CO2e	0 kg CO2e	18,745,935 kg CO2e	5,760,248 kg CO2e	############	852,693 kg CO2e	5,568,826 kg CO2e	6,969 kg CO2e	76,851,108 kg CO2e	-28,507,770 kg CO2e
	TOTAL - kg CO2e/m2 GIA	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Notes:
* Report non-decarbonised values for both material and operational emissions using current status of the electricity grid.

Mandatory cells for completion

ASSESSMENT 2 - expected decarbonisation of the electricity grid

GWP POTENTIAL FOR ALL LIFE-CYCLE MODULES[1] (kgCO2e)		Sequestered (or biogenic) carbon (negative value) (kgCO2e)	Product stage (kgCO2e)	Construction process stage (kgCO2e)		Use stage (kgCO2e)							End of Life (EoL) stage (kgCO2e)				TOTAL Modules A-C kgCO2e	Benefits and loads beyond the system boundary (kgCO2e)
			Module A			Module B							Module C					
Building element category			[A1] to [A3]	[A4][2]	[A5]	[B1]	[B2]*	[B3]*	[B4]*	[B5]*	[B6]	[B7]	[C1]	[C2]	[C3]	[C4]		Module D*
0.1	Demolition: Toxic/Hazardous/Contaminated Material Treatment												############				163,955 kg CO2e	
0.2	Major Demolition Works																0 kg CO2e	
0.3	Temporary Support to Adjacent Structures		5,819,368 kg CO2e	22,604 kg CO2e	320,707 kg CO2e									58,036 kg CO2e	3,068 kg CO2e	3,593 kg CO2e	6,227,375 kg CO2e	-2,811,663 kg CO2e
0.4	Specialist Ground Works																0 kg CO2e	
0.5	Temporary Diversion Works																0 kg CO2e	
1	Substructure	0 kg CO2e	4,957,745 kg CO2e	447,285 kg CO2e	156,530 kg CO2e									126,289 kg CO2e	18,965 kg CO2e		5,706,814 kg CO2e	-1,750,039 kg CO2e
2.1	Superstructure: Frame	0 kg CO2e	5,538,245 kg CO2e	34,799 kg CO2e	188,397 kg CO2e									239,432 kg CO2e	14,356 kg CO2e	125 kg CO2e	6,015,354 kg CO2e	-3,193,532 kg CO2e
2.2	Superstructure: Upper Floors	0 kg CO2e	7,485,580 kg CO2e	66,997 kg CO2e	441,200 kg CO2e				1,343,291 kg CO2e					272,892 kg CO2e	18,331 kg CO2e	1,128 kg CO2e	9,819,917 kg CO2e	-12,192,314 kg CO2e
2.3	Superstructure: Roof	-8,612 kg CO2e	1,452,129 kg CO2e	12,536 kg CO2e	108,158 kg CO2e				139,783 kg CO2e					42,088 kg CO2e	49,625 kg CO2e	638 kg CO2e	1,816,169 kg CO2e	-268,069 kg CO2e
2.4	Superstructure: Stairs and Ramps	0 kg CO2e	18,297 kg CO2e	280 kg CO2e	0 kg CO2e									357 kg CO2e	42 kg CO2e		18,976 kg CO2e	-4,705 kg CO2e
2.5	Superstructure: External Walls	0 kg CO2e	1,151,401 kg CO2e	15,297 kg CO2e	85,939 kg CO2e				423,476 kg CO2e					15,787 kg CO2e	1,262 kg CO2e	539 kg CO2e	1,753,754 kg CO2e	-247,301 kg CO2e
2.6	Superstructure: Windows and External Doors	-172 kg CO2e	131,937 kg CO2e	121 kg CO2e	0 kg CO2e				124,360 kg CO2e					912 kg CO2e	249 kg CO2e	7 kg CO2e	275,050 kg CO2e	-70,416 kg CO2e
2.7	Superstructure: Internal Walls and Partitions	0 kg CO2e	1,081,691 kg CO2e	22,159 kg CO2e	56,770 kg CO2e									28,221 kg CO2e	3,336 kg CO2e		1,192,177 kg CO2e	-139,161 kg CO2e
2.8	Superstructure: Internal Doors	-1,149,291 kg CO2e	622,402 kg CO2e	3,121 kg CO2e	0 kg CO2e				1,111,736 kg CO2e					2,401 kg CO2e	1,155,739 kg CO2e	326 kg CO2e	1,904,092 kg CO2e	
3	Finishes	0 kg CO2e	65,379 kg CO2e	243 kg CO2e	11,893 kg CO2e				143,250 kg CO2e					205 kg CO2e	53,091 kg CO2e	8 kg CO2e	294,384 kg CO2e	-125 kg CO2e
4	Fittings, furnishings & equipment	-4,134,544 kg CO2e	3,929,677 kg CO2e	17,698 kg CO2e	255,220 kg CO2e			105,886 kg CO2e	2,890,160 kg CO2e					32,287 kg CO2e	4,170,646 kg CO2e	381 kg CO2e	7,692,287 kg CO2e	-1,321,821 kg CO2e
5	Services (MEP)	0 kg CO2e	4,110,717 kg CO2e	10,500 kg CO2e	36,568 kg CO2e	9,317 kg CO2e	52,377 kg CO2e		3,934,549 kg CO2e					32,392 kg CO2e	3,040 kg CO2e	213 kg CO2e	33,261,254 kg CO2e	-2,778,032 kg CO2e
6	Prefabricated Buildings and Building Units																0 kg CO2e	
7	Work to Existing Building						371,165 kg CO2e										423,801 kg CO2e	
8	External works	-76,885 kg CO2e	89,304 kg CO2e	343 kg CO2e	500 kg CO2e				169,909 kg CO2e					1,395 kg CO2e	77,077 kg CO2e	10 kg CO2e	285,748 kg CO2e	-189,924 kg CO2e
	TOTAL kg CO2e	-5,369,504 kg CO2e	36,453,872 kg CO2e	653,981 kg CO2e	1,661,880 kg CO2e	9,317 kg CO2e	423,542 kg CO2e	105,886 kg CO2e	10,280,515 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	############	852,693 kg CO2e	5,568,826 kg CO2e	6,969 kg CO2e	76,851,108 kg CO2e	-24,967,105 kg CO2e
	TOTAL - kg CO2e/m2 GIA	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Notes:
* Report decarbonised values for both material and operational emissions using expected decarbonisation of the electricity grid.

temple

CREATING SUSTAINABLE FUTURES

London
3rd floor
The Clove Building
4 Maguire Street
London
SE1 2NQ

+44 (0)20 7394 3700
enquiries@templegroup.co.uk
templegroup.co.uk