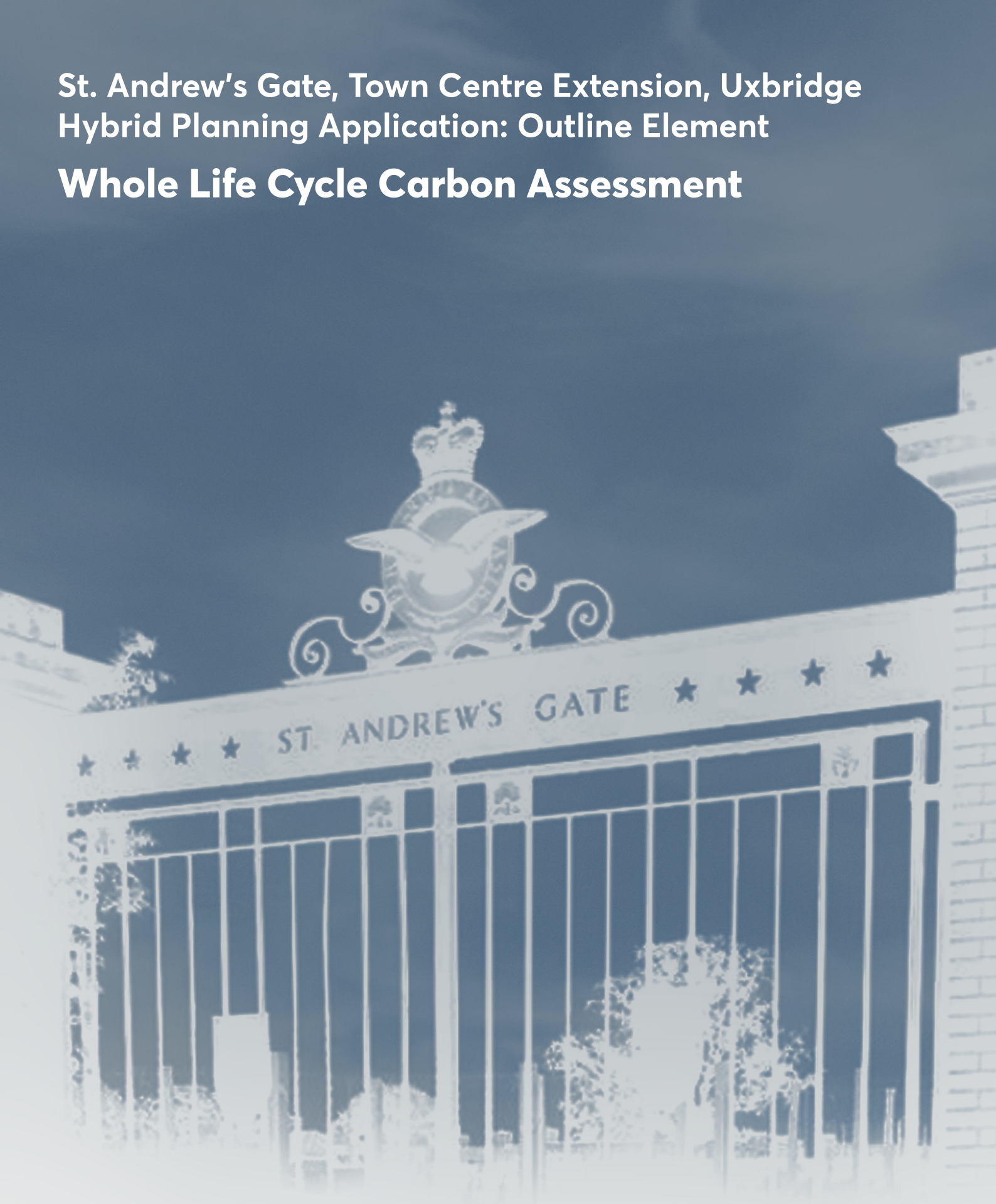
St. Andrew's Gate, Town Centre Extension, Uxbridge
Hybrid Planning Application: Outline Element

Whole Life Cycle Carbon Assessment



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Whole Life Cycle Carbon Assessment – Outline Element

Vinci St Modwen (VSM)

St Andrew's Gate, Town Centre Extension, Uxbridge

Final

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BSc (Hons)

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ABOUT HODKINSON CONSULTANCY

Our team of technical specialists offer advanced levels of expertise and experience to our clients. We have a wide experience of the construction and development industry and tailor teams to suit each individual project.

We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for quality and construction efficiency.

Executive Summary

This Whole Life Cycle Carbon (WLCC) Assessment for the proposed development at St Andrew's Gate, Town Centre Extension, Uxbridge in the London Borough of Hillingdon, has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Vinci St Modwen (VSM). It relates to the Outline Element of the Hybrid Planning Application only. A separate WLCCE has been submitted in relation to the Full Element in accordance with paragraph 3.2.10 of the Whole Life Carbon London Plan Guidance (LPG) document.

National Building Regulations for new development account for a building's operational carbon emissions. As methods and approaches for reducing operational emissions have become better understood, and as targets have become more stringent, these emissions are now beginning to make up a declining proportion of a development's carbon emissions. Attention now needs to turn to WLCCE to incorporate embodied carbon emissions, enabling a better understanding of the environmental impact of the proposed development.

WLCCE are the carbon emissions resulting from the construction and the use of a building over its entire life, through four stages described as life-cycle modules, as shown in Figure i;

Figure i: Life cycle modules included within WLCC assessment

They capture a building's operational carbon emissions from both regulated and unregulated energy use, as well as its embodied carbon emissions. Embodied emissions are those associated with raw material extraction, manufacture and transport of building materials, construction and the emissions associated with maintenance, repair, and replacement as well as dismantling, demolition, and eventual material disposal. The assessment provides a picture of a building's carbon impact on the environment.

This WLCC assessment is being undertaken in compliance with London Plan 2021 Policy (SI 2). The methodology 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 following table outlines the assumptions made within this WLCCE assessment:

Table i: WLCCE assumptions

Data	Data source
Material types and volumes (A1-A3)	Material types were provided by the Applicant where available. Default assumptions from One-Click LCA Carbon designer estimation software was used where information was unavailable.
Transport data (A4)	Default values provided by One Click.
Construction site impacts (A5)	Estimated construction value provided by the Applicant and baseline target provided by BRE.
Refrigerants (B1)	Refrigerant quantity has been estimated based on the use of approximately 75 kg of R32 within the Air Source Heat Pumps with annual leakage of 2% with a 99% end of life recovery (as per TM65).
Maintenance (B2)	B2 emissions have been calculated at 10kgCO_2/m^2, 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 does not have ways to consider B5 emissions. However, based on the information provided for B3 and B4 it is likely that these have emissions have been accounted for.
Operational energy (B6)	Energy calculations based on SAP 10.2 and SBEM modelling by Hodkinson Consultancy (May 2024). TM54 was not undertaken as this relates to the Outline Element of the Hybrid Planning Application.
Operational water (B7)	Water consumption based on Building Regulations Part G 'Enhanced Consumption' of 110 l/pp/d and multiplied by the intended full occupancy of the development.

Data	Data source
End of life (C1-C4)	Default values provided by One Click based on the information within the EPD database.
Building areas	The illustrative Gross Internal Floor Area (GIA) for the Outline Element of the scheme provided by Pollard Thomas Edwards is as follows: Total Residential GIA: 30,708 m^2 Total Non-Residential GIA: 7,397 m^2 Total: 38,105 m^2
Number of occupants	Approximately 1,035 based on the maximum occupancy assumed from the illustrative Accommodation Schedule.
Assessment period	60 years

The total indicative emissions, based on the GLA guidance is **653 $kgCO_2/m^2$ GIA over 60 years excluding sequestered carbon or 628 $kgCO_2/m^2$ when sequestered carbon is included.**

> 450 $kgCO_2/m^2$ for modules A1-A5 (excluding sequestered carbon).

> 203 $kgCO_2/m^2$ for modules B-C.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be **991 $kgCO_2/m^2$ GIA over 60 years.**

The proposed development is performing better than GLA benchmarks for all modules and is therefore compliant with London Policy SI 2. The results demonstrate that the development has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available, as shown in Figure ii.

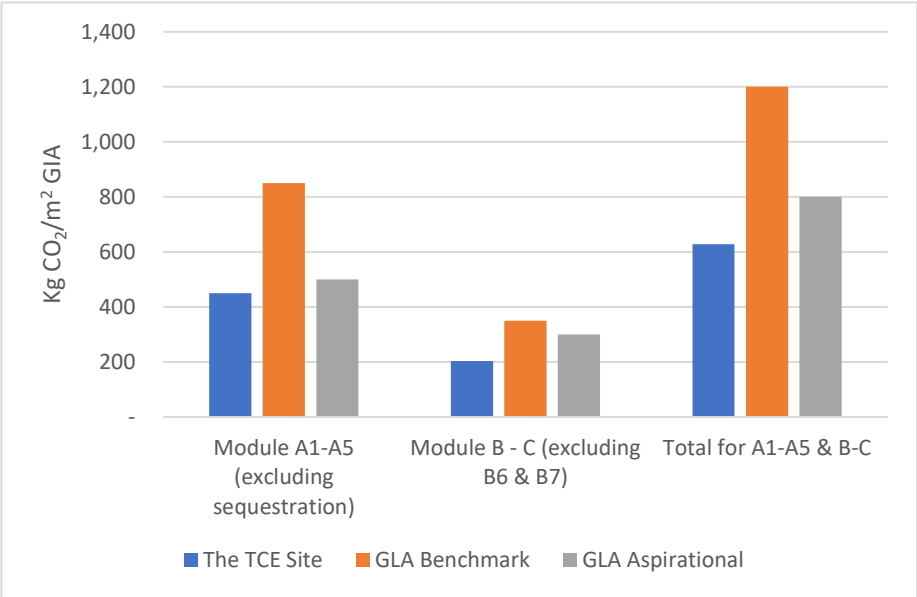

Figure ii: Total Indicative kgCO_2 /m² Gross Internal Floor Area (GIA) performance compared to GLA Benchmarks

CONTENTS

1. INTRODUCTION

1.1 This Whole Life Cycle Carbon (WLCC) Assessment for the outline element of the Hybrid application at St Andrew's Gate, Town Centre Extension, Uxbridge, hereafter referred to as 'the TCE Site' within the London Borough of Hillingdon has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Vinci St Modwen, hereafter referred to as 'the Applicant'. It relates to the Outline Element of the Hybrid Planning Application only. A separate WLCCE has been submitted in relation to the Full Element. in accordance with paragraph 3.2.10 of the Whole Life Carbon London Plan Guidance (LPG) document.

1.2 The purpose of this WLCC assessment is to demonstrate an initial assessment of the outline element of the Hybrid application, has been undertaken, based on the information available at this stage.

1.3 National Building Regulations new development account for a building's operational carbon emissions. As methods and approaches for reducing operational emissions have become better understood, and as targets have become more stringent, these emissions are now beginning to make up a declining proportion of a development's carbon emissions. Attention now needs to turn to WLCCE to incorporate embodied carbon emissions, enabling a better understanding of the environmental impact of the proposed development.

1.4 The assessment of the outline element of the Hybrid application endeavours to help the design team understand, at concept design stage, the lifetime consequences of their design decisions. This report only pertains to the outline portion of the hybrid application and should be read in conjunction with the '*GLA Whole Life Carbon Assessment Template*' which has been submitted alongside this application.

2. DEVELOPMENT OVERVIEW

Site Location

2.1 The proposed development site at the TCE Site is located in the London Borough of Hillingdon, as shown in Figure 1 below.

Figure 1: Site Location – Map data © 2023 Google

Proposed Development

2.2 The proposed development is described as follows:

"Hybrid planning permission comprising:

Outline planning permission (with all matters reserved) for residential development and commercial uses, to be occupied flexibly within Use Classes E(a), E(b), E(c), E(e), E(g)(i), E(g)(ii);and a convenience store (Use Class E(a)); plus car parking, hard and soft landscaping, and all other associated works.

Full planning permission for reinstatement of gym use (Use Class E(d)) and change of use to provide a café (Use Class E(b)) within the former cinema building; and external alterations; and associated car parking, hard and soft landscaping and all other associated works.

Masterplan to be delivered on a phased basis with Full proposals for the former cinema building to be delivered alongside Outline phases."

2.3 The hybrid application seeks planning consent for the following:

2.4 In outline:

> Creation of up to no. 356 residential dwellings (Class C3) within three new build blocks, of up to 10 storeys;

> Up to 660sqm GIA of flexible commercial space (Use Classes E(a), E(b), E(c), E(e), E(g)(i) and E(g)(ii)) at ground floor level in Building Zones B and C, and up to 440sqm fixed as a convenience store (Use Class E(a)) (GIA) located in Building Zone C; and

> Associated car parking and hard and soft landscaping.

2.5 In full:

> Change of use of the former cinema building to reinstate a gym (E(d)) in the Main Hall and change of use of former squash courts to a café (E(b));

> Associated car parking and hard and soft landscaping and access alterations

> External alterations to the building

2.6 The details of the refurbishment of the building including all internal and external alterations are to be secured by a Listed Building Consent submitted in parallel.

2.7 Figure 2 overleaf shows the illustrative site layout.

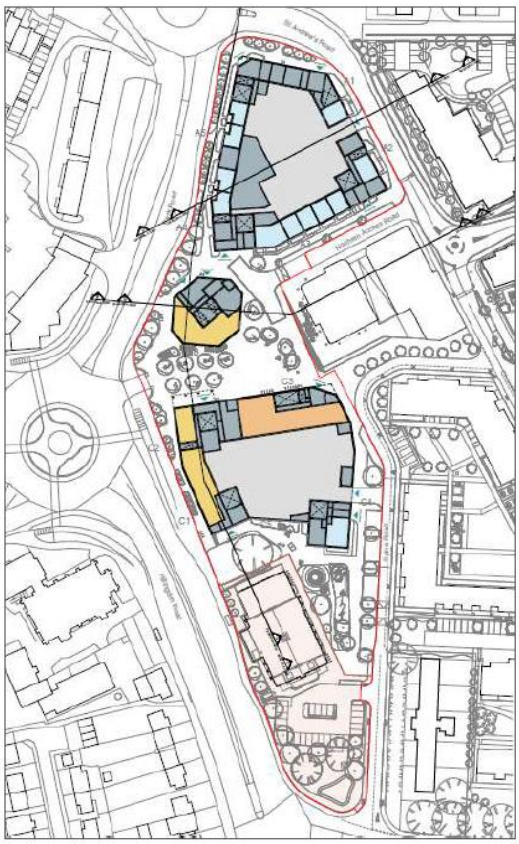

Figure 2: Illustrative Scheme – Pollard Thomas Edwards, May 2024

2.8 The total Gross Internal Floor Area (GIA) of the proposed illustrative scheme, calculated for the purpose of this report is as follows:

> Total Residential GIA: 30,708 m^2

> Total Non-Residential GIA: 7,397 m^2

> **Total: 38,105 m^2**

3. POLICY AND REGULATIONS

Regional Policy: The London Plan

London Plan (2021)

3.1 The London Plan sets out an integrated economic, environmental, transport and social framework for the development of London. The following policies are considered relevant to the proposed development and this Statement:

3.2 **Policy SI 2 Minimising Greenhouse Gas Emissions, states:**

'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:

Operational carbon emissions will make up a declining proportion of a development's whole life-cycle carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e., those associated with cooking and small appliances), its embodied emissions (i.e., those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal). Whole life-cycle carbon emission assessments are therefore required for development proposals referable to the Mayor. Major non-referable development should calculate unregulated emissions and are encouraged to undertake whole life-cycle carbon assessments. The approach to whole life-cycle carbon emissions assessments, including when they should take place, what they should contain and how information should be reported, will be set out in guidance'.

Guidance Documents

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

3.4 The guidance recognises that less information will be available in relation to Outline applications and confirms that as much information should be provided as possible. It notes that the information presented in the Outline WLCC should be reviewed at reserved matter stage and updated where required.

3.5 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.

3.6 In addition, the following guidance is available to conduct assessments:

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

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

> **RICS Professional Statement Whole life carbon assessment: 2017 -** *Whole life carbon assessment for the built environment.*

3.7 The above documents are used to complete the WLCCE assessment, further planning reports submitted alongside this report will also be used and/or referenced within this assessment, including:

> Energy Statement- Hodkinson Consultancy (June 2024).

> Design and Access Statement – Pollard Thomas Edwards (May 2024).

4. WHOLE LIFE CYCLE CARBON EMISSIONS ASSESSMENT

4.1 Undertaking WLCCE assessments is a way to fully understand and minimise the carbon emissions associated with building designs over the entire life cycle of the building.

4.2 The London Plan has introduced a requirement (Policy SI 2 *'Minimising Greenhouse Gas Emissions'*) for all new referable developments to calculate and reduce WLCCE, this is both embodied and operational carbon:

> **Operational carbon** is the energy required to heat and power a building;

> **Embodied carbon** is the carbon that is released in the manufacturing, production, and transportation of the building materials used.

4.3 In addition to the two metrics above there are additional life cycle stages that are considered during WLCCE assessments, these include demolition, end of life and refurbishment/replacement cycles.

4.4 The two metrics (operational and embodied) and the additional life cycle stages, as noted above, have been included in this WLCCE assessment as per GLA guidance.

4.5 Undertaking a WLCCE assessment provides a full overview of the material and construction of a building using science-based metrics whilst also identifying the overall best combined opportunities for reducing lifetime emissions, and also helps to avoid any unintended consequences of focusing on operational emissions alone.

Methodology

4.6 WLCCE assessments are sensitive to changes in design and specification and therefore detailed design will impact the results as the scheme progress. As noted in the GLA guidance, WLCCE assessments should be conducted at the following stages in order to maximise design efficiencies:

> Pre application;

> Stage 1 submission (RIBA 2/3);

> Post construction (RIBA 6).

4.7 This assessment is considered to be the Stage 1 submission and has been completed for the outline element of the hybrid application using the illustrative scheme drawings and parameter plans provided by Pollard Thomas Edwards June 2024) and energy calculations from the Energy Statement submitted for planning (Hodkinson Consultancy, June 2024).

4.8 A set of WLCCE benchmarks have been developed by the GLA , the WLCCE baseline of the proposed scheme is expected to be compared to the most relevant benchmark.

Study Period

4.9 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.

Operational Carbon

4.10 Operational energy is the inputted energy required for all heating and power needs. It can be split into two variants:

- **Regulated emissions** are assessed using the Government's approved methodology for Building Regulations Part L compliance, the Standard Assessment Procedure (SAP) for residential units and the Simplified Building Energy Model (SBEM) for non-residential units; and

- **Unregulated emissions** are energy use as a direct result of user behaviour. This includes cooking, white goods (fridges, washing machines, etc), and plug-in electrical loads (televisions, laptops, lamps, etc).

4.11 Both of the above elements have been accounted for in this WLCCE assessment, these were provided by the calculations completed for the Energy Statement submitted for planning (Hodkinson Consultancy, June 2024). For clarity, as unregulated energy demands are largely reliant on the behaviour of occupants, they have been considered a fixed entity in the calculations in accordance with the guidance.

Non-Residential

4.12 The estimated energy demand for the non-residential floorspace, Outline Element has been estimated using Simplified Building Energy Model (SBEM) software, using the National Calculation Method (NCM 2021 Edition). SBEM calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items, as well as unregulated energy demands. Operational unregulated energy demands associated with non-residential items outside of the commercial space (i.e. electric vehicle charging, external lighting, corridors, and lifts) are accounted for separately.

4.13 A sample shell only SBEM calculation has been carried out on the commercial unit. The sample calculation has been extrapolated to gain energy demand estimates representative of the total area to be provided.

Residential

4.14 The estimated annual energy demand for the residential portion of the development has been calculated using Standard Assessment Procedure (SAP) methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items.

4.15 SAP calculations have been carried out for representative home types. To provide energy demands across the units, the indicative accommodation schedule has been used to extrapolate the energy performance across the whole application area.

4.16 The unregulated energy demands for the residential units have been calculated using the methodology outlined in the SAP 10.2 document. This calculates the CO_2 emissions associated with appliances and cooking and are calculated using the BRE methodology.

TM54 Modelling

4.17 As this is an outline application, TM54 modelling has not been undertaken. SBEM modelling, which is a complaint methodology has been used for the commercial space energy calculations, as outlined above in the non-residential methodology.

4.18 The principles of the TM54 methodology have been applied to determine non-residential ancillary energy demands for electric vehicle charging, external lighting, corridors, and lifts. As these energy demands are neither associated with the residential units or commercial space, they are categorised separately as landlord's unregulated energy demand. In line with the energy hierarchy, these ancillary energy demands are presented separately in the Be Seen stage.

Embodied Carbon

One Click LCA

4.19 OneClick LCA is the software that has been used to conduct the WLCCE assessment. This is a web-based piece of design software for buildings and infrastructure approved for use by the GLA.

4.20 OneClick LCA consists of a large database of generic and average Life Cycle Indicator (LCI) data, and global Environmental Product Declaration (EPDs). The most suitable option for each material (where available) was chosen from the database in OneClick. The material LCI data has been chosen to be representative of the typical UK supply chain.

4.21 The life cycle stages (or modules) included within the WLCCE assessment as standard are shown in Figure 3 below.

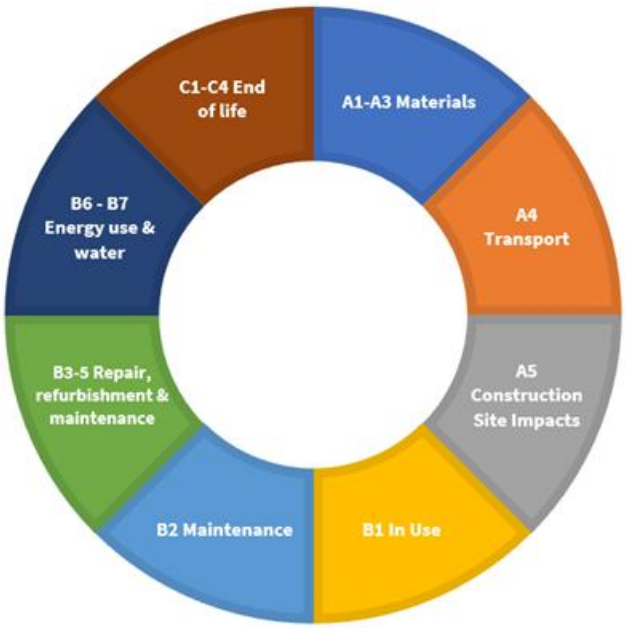

Figure 3: Life cycle modules

4.22 At this, Outline stage it is not expected that all the information will be available, in accordance with the GLA guidance. Where this is the case, One Click has been used to calculate the required values for the assessment. The assessment will be reviewed at reserved matters stage and updated where required.

Construction Impacts

4.23 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 CO_2e per £100,000 of project value, this is further referenced and approved by the BRE. The estimated project value has been provided by the Applicant, which has allowed the construction transport GHG emissions to be included.

Potable Water Use

4.24 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 is based on Building Regulations Part G 'enhanced consumption' of 110 litres/per person/per day (including 5 litres for external water use) and multiplied by the intended full occupancy of the development annually.

4.25 1,035 occupants have been assumed based upon the expected number of residents on site as per an estimate based on an illustrative scheme. This gives an estimated **annual water consumption of 41,555 m³** for the entire development for 60 years.

Carbon Sequestration

4.26 Sequestered carbon in timber has been included in the WLCC assessment as all timber is assumed to be sustainably sourced.

Data Sources

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

Table 1: Data Sources

Data	Data source
Material types and volumes (A1-A3)	Material types were provided by the Applicant where available. Default assumptions from One-Click LCA Carbon designer estimation software was used where information was unavailable.
Transport data (A4)	Default values provided by One Click.
Construction site impacts (A5)	Construction value provided by the Applicant and baseline target provided by BRE.
Refrigerants (B1)	Refrigerant quantity has been estimated based on the use of approximately 75 kg of R32 within the Air Source Heat Pumps with annual leakage of 2% with a 99% end of life recovery (as per TM65).
Maintenance (B2)	B2 emissions have been calculated at 10kgCO_2/m^2, 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 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 SAP 10.2 and SBEM modelling by Hodkinson Consultancy (June 2024).

Data	Data source
	TM54 was not undertaken as this is an outline application.
Operational water (B7)	Water consumption based on Building Regulations Part G 'Enhanced Consumption' of 110 l/pp/d and multiplied by the intended full occupancy of the development.
End of life (C1-C4)	Default values provided by One Click based on the information within the EPD database.
Building areas	The illustrative Gross Internal Floor Area (GIA) for the Outline element of the scheme provided by Pollard Thomas Edwards is as follows: Total Residential GIA: 30,708 m^2 Total Non-Residential GIA: 7,397 m^2 Total: 38,105 m^2
Number of occupants	Approximately, 1,035 based on the maximum occupancy assumed from the illustrative Accommodation Schedule.
Assessment period	60 years

4.28 For clarity, all assumptions made within the WLCCE assessment have been noted within this report. The assessment and comments made throughout should be taken within the context of carbon and energy use only.

5. WHOLE LIFE CYCLE CARBON RESULTS

5.1 As noted above, this is an initial assessment based on the best available information. The information presented will be reviewed at reserved matters stage and updated where required in line with GLA requirements.

Benchmark Comparison

5.2 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 2 below:

Table 2: Whole Life Carbon Baseline (GLA Guidance)

	The TCE Site	WLC Benchmark
Modules A1 – A5	**450 kg CO_2e/ m^2 GIA**	<850 kg CO_2e/ m^2 GIA
Modules B – C (excluding B6 and B7)	**203 kg CO_2e/ m^2 GIA**	<350 kg CO_2e/ m^2 GIA
Total A – C (excluding B6/B7 and sequestered carbon)	**653 kg CO_2e/ m^2 GIA**	<1,200 kg CO_2e/ m^2 GIA

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

5.4 The total emissions, based on the GLA guidance is **653 kgCO_2/m^2 GIA over 60 years excluding sequestered carbon or 628 kgCO_2/m^2 when sequestered carbon is included**.

> 450 kgCO_2/m^2 for modules A1-A5 (excluding sequestered carbon).

> 203 kgCO_2/m^2 for modules B-C.

5.5 When operational energy and water emissions are included in the calculation above the total indicative emissions are expected to be **991 kgCO_2/m^2 GIA over 60 years.**

5.6 A set of WLCCE benchmarks have been developed by the GLA, the WLCCE baseline of the proposed scheme is expected to be compared to the most relevant benchmark.

5.7 The indicative WLCCE are lower than the GLA WLC Benchmark for all modules, and the total emissions. As this assessment pertains to the Outline Element of the Hybrid Planning Application, the detailed design and material specifications are not yet known. As such, assumptions have been made in line with industry guidance and One Click Carbon Designer has been used to determine quantities. This demonstrates that the development has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available, as shown in Figure 4 below.

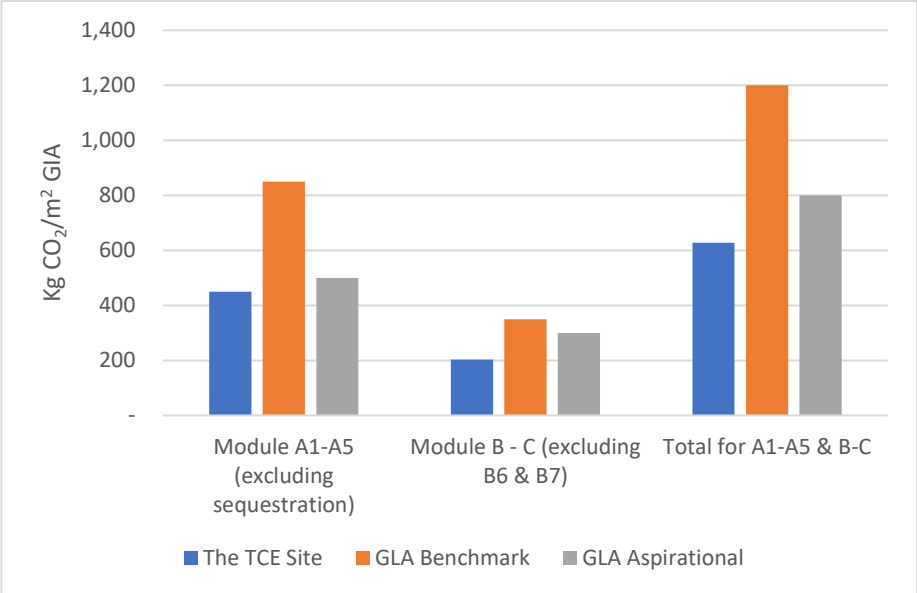

Figure 4: Total Indicative kgCO_2/m² GIA performance compared to GLA Benchmarks

5.8 These indicative benchmarks will be reviewed at reserve matters stage. The full results are as follows:

Table 3: Full Indicative WLCCE Results

Category	Global warming potential	Indicative Total kgCO_2e over 60 years	Indicative Total kgCO_2e/m² GIA over 60
A1-A3	Construction Materials	15,154,818	398
A4	Transport	279,347	7
A5	Site operations	1,720,223	45
B1	In Use	64,576	2
B2	Maintenance	381,050	10
B3	Repair	95,263	2.5

Category	Global warming potential	Indicative Total $kgCO_2e$ over 60 years	Indicative Total $kgCO_2e/m^2$ GIA over 60
B4	Replacement/Refurbishment	5,533,357	14
B6	Operational energy use	8,692,503	13
B7	Operational water use	48,869	1
C1-C4	End of life	1,675,364	44
	Total	**38,812,583**	**1,018**
	Carbon Sequestering	-983,646	-26
	TOTAL	**37,828,937**	**993**

5.9 The above results demonstrate that **37,828 tonnes** are expected to be emitted over a 60-year period.

5.10 The operational energy (B6) makes up 36% of the overall indicative emissions for the proposed development; 22% for regulated energy use and 13% for unregulated use.

5.11 Materials (A1 – A3) make up 39% of the overall indicative emissions. Further material detail will be available during subsequent Reserved Matters Applications.

5.12 The transport of materials to site and construction stages (A4 and A5) account for 5% of the overall indicative emissions. Whilst this is small in comparison to elements it is still important to reduce transport emissions through the local sourcing of materials and to reduce consumption of energy and water during consumption, where possible.

5.13 There are also impacts, with the in-use life-cycle module B1-B5 making up approximately c.16% of all indicative embodied carbon emissions. This is primarily due to materials that will need replacing over the 60-year study period.

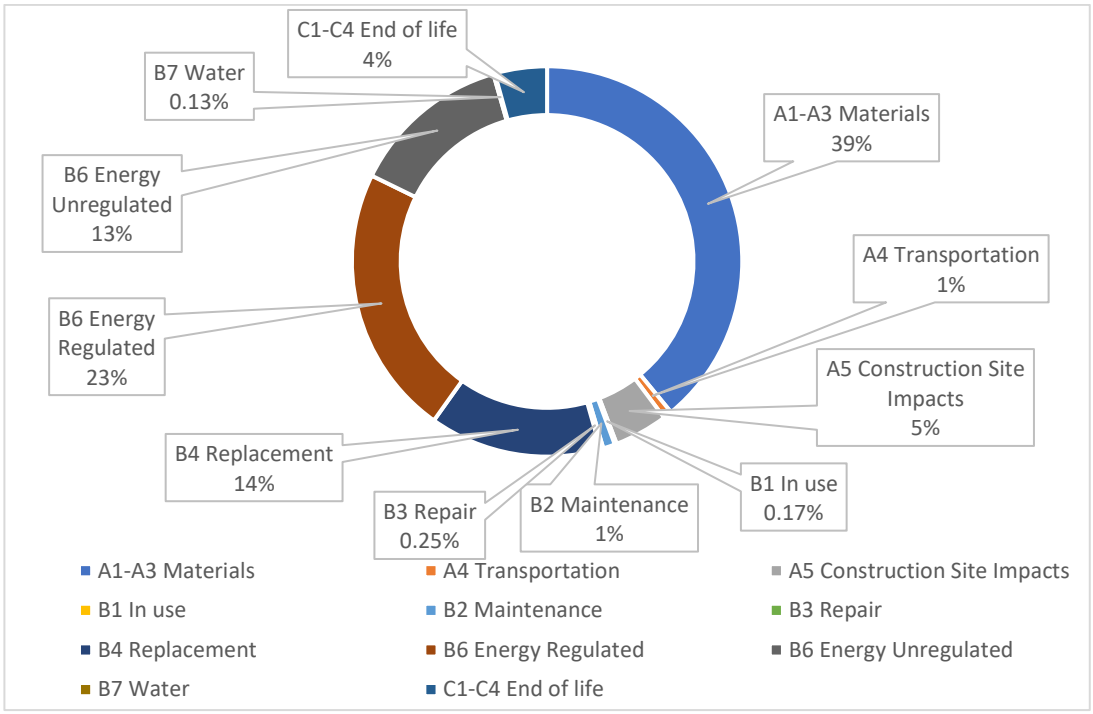

Figure 5: Total $kgCO_2e$ - Life-cycle stages

6. MEASURES IMPLEMENTED AND OPPORTUNITIES

Measures Implemented

6.1 As the scheme is currently in Outline stage, the materials specifications have not yet been confirmed. At subsequent Reserved Matters Application, material and design options will be explored in order to reduce overall emissions. Below is a list of high-level opportunities the Design Team have been asked to consider as they work through the design process.

Opportunities

Reduce material use

6.2 The **future demolition and deconstruction** of the development could be considered at the design stage. Consideration to be given to ways to facilitate dismantling, where possible.

6.3 Non-load bearing internal walls contribute material to the building that could otherwise be avoided. By **reducing the volume of non-load bearing walls** where possible, associated embodied carbon is also reduced.

6.4 The façade is under constant wear from the environment which can lead to frequent repairs and maintenance. By using **durable materials** for exposed elements, this not only reduces the cost and frequency of refurbishment but also reduces the use of material replacement and its associated carbon footprint.

6.5 Using pre-cast concrete floor slabs, where possible, as opposed to hollow-core floor slabs could result in **carbon emissions savings of approximately 60 kgCO_2/m².** The use of pre-cast concrete would also support the circular economy principles for the site.

6.6 Similarly, **an extensive maintenance and repair schedule** could also be produced during the design life of the development to ensure that specific materials and pieces of equipment are able to remain in situ during their expected lifespan. This will minimise the need to replace and refurbish and reduce emissions under life cycle stages C1-C4.

Recycled materials

6.7 **Innovative cement mixes** are now increasingly available, using a mixture that is 18% limestone can save up to **20 kgCO_2/m²** in carbon emissions. This cement mixture could be investigated further for use at the appropriate stage, and if suitable could be used for building elements such as foundations. If implemented, this could facilitate the reduction of life cycle stages A1-A3 (materials) quite significantly.

6.8 Areas of hardstanding could make use of **recycled crushed concrete/gravel** to remove the associated carbon emissions from the assessment. These materials could similarly be recycled at the end-of-life scenario.

6.9 At end-of-life, **concrete can be completely recycled**. After demolition, concrete can be processed and used as recycled aggregate in fresh concrete. If the site is intended for new construction the demolished concrete can be crushed on-site and used onsite as hard core, fill, or in landscaping.

Re use of materials

6.10 The Circular Economy statement produced by Hodkinson Consultancy (June 2024) details the illustrative strategy for **recovery and reuse of materials**. Please refer to the report for further detail.

7. CONCLUSION

7.1 This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for Outline Element of the Hybrid Application for the TCE Site within the London Borough of Hillingdon has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development.

7.2 The purpose of this WLCCE assessment is to demonstrate that for Outline Element of the Hybrid Application has undertaken an initial assessment based on the information available to date which will need to be updated as the project progresses. The information will be reviewed at reserved matter stage and updated where required.

7.3 The total indicative emissions, based on the GLA guidance is **653 $kgCO_2/m^2$ GIA over 60 years excluding sequestered carbon or 628 $kgCO_2/m^2$ when sequestered carbon is included**.

> 450 $kgCO_2/m^2$ for modules A1-A5 (excluding sequestered carbon).

> 203 $kgCO_2/m^2$ for modules B-C.

7.4 When operational energy and water emissions are included in the calculation above the total indicative emissions are expected to be **991 $kgCO_2/m^2$ GIA over 60 years.**

7.5 The expected WLCCE are lower than the GLA WLC Benchmark for all modules, and the total emissions. The detailed design and material specifications will be defined in future RMAs and are not yet known. As such, assumptions have been made in line with industry guidance and One Click Carbon Designer has been used to determine quantities. Though these assumptions provide robust estimates at this point in time, it would be expected that these values will change at reserved matters stage. This demonstrates that the development has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available. As such, future Reserved Matters Applications are also likely to be within the GLA benchmark parameters.