HODKINSON

Whole Life Cycle Carbon Emissions Assessment

Highgate Care Ltd

Former Mary Fielding Care Home

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 Emissions (WLCCE) Assessment for the proposed development at Mary Fielding Guild Care home located at 103-107 North Hill, by Highgate Care Limited in the London Borough of Haringey has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Highgate Care Ltd.

The proposed development will comprise the construction of a 50 bed care home and a new block of nine residential flats.

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 WLCCE 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 WLCCE 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)	A cost plan was provided by the Applicant so it can be confirmed that 95% of the cost allocated to each building element has been accounted for. Where there were unknowns (in terms of material types and quantities), One Click Carbon Designer was used.
Transport data (A4)	Default values provided by One Click.
Construction site impacts (A5)	Construction value provided by applicant and baseline target provided by BRE. Waste estimates were provided by the Applicant.
Refrigerants (B1)	Refrigerant quantity has been estimated based on a project of a similar size and scope as this detail is not yet known. This assumes an annual leakage of 2% and 1% end of life leakage rate 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 figures based on Energy calculations by Hodkinson Consultancy (June, 2024).

Data	Data source
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	Building areas were provided by the architect in the drawings- 4,479 m^2
Number of occupants	Care Home - 50 Residential- 16 Total- 66
Assessment period	60 years

The total emissions, based on the GLA guidance is **827 $kgCO_2/m^2$ GIA over 60 years excluding sequestered carbon or 796 $kgCO_2/m^2$ when sequestered carbon is included.**

- 525 $kgCO_2/m^2$ for modules A1-A5 (excluding sequestered carbon).
- 302 $kgCO_2/m^2$ for modules B-C.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be **2,374 $kgCO_2/m^2$ 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.

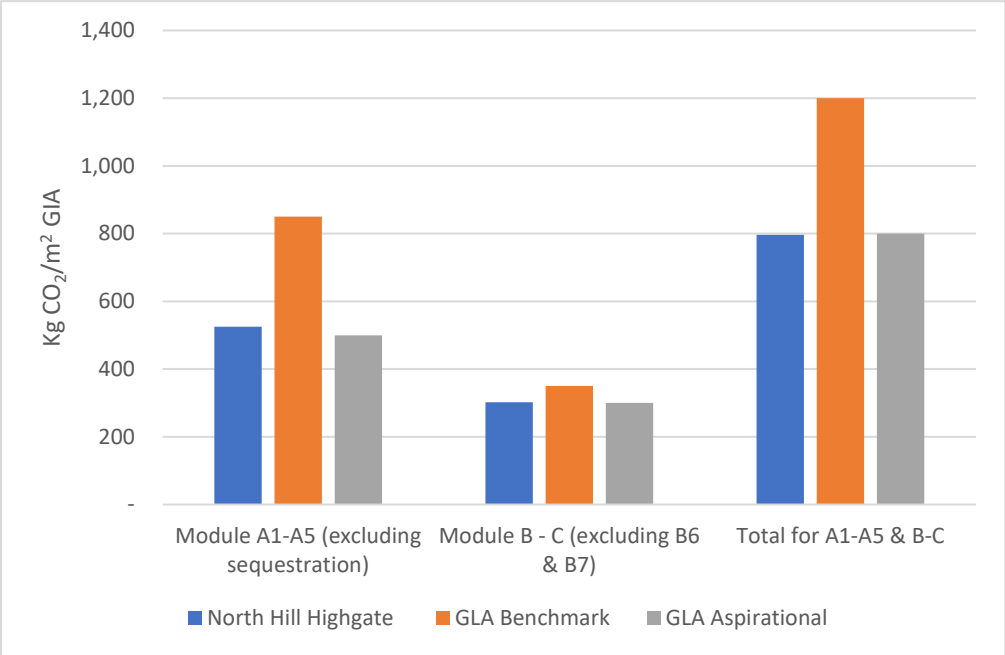

Figure ii: Total kgCO_2 /m^2 Gross Internal Floor Area (GIA) performance compared to GLA Benchmarks

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

Table ii below summaries the elements required for a GLA compliant assessment and, where appropriate, where the information can be found.

Table ii: Summary of required elements for GLA WLCCA

Item	Detail	Further information
1	Project assessment details	**Project description** – Demolition of existing buildings and redevelopment to provide a new 50-bed rehabilitation clinic (Class C2 – Residential Institutions) principally fronting onto and accessed from View Road together with a separate residential (Class C3 - Dwelling House) block fronting North Hill. This consists of 9 flats (5 x 1 bed; 3 x 2 bed and 1 x 3 bed).
		GIA – 4,479 m^2
		Operational modelling for Module B6 – SAP 10.2 and SBEM

Item	Detail	Further information
		Reference study period – 60 years
		Software used- One Click LCA
1	Project assessment details	**Type of EPDs and carbon database used** – One Click defaults
2	Confirmation that the assessment accounts for a minimum of 95% of the capital cost allocated to each building elements category	Yes – 95% of the capital cost is included in the assessment, confirmed via the cost plan.
3	Explanation of third-party mechanisms that have been adopted to quality assure the submission	All work has been completed by a competent individual Luke Sparrow, (BSc (Hons)) who has undertaken numerous LCAs for GLA compliance. They are suitably competent to complete the work. All work independently QA'ed by Zeta Stebbings, (BSc (Hons), MSc, CEnv, MIEMA) who is an expert in LCA.
4	Estimated total WLC emissions for each life-cycle module	A full breakdown of results can be found in the accompanying GLA WLCCA Template
5	Confirmation that options for retaining existing building and structures have been fully explored.	Options for retaining existing building and structures have been fully explored.
6	Carbon emissions associated with pre-construction demolition	1,547 tCO_2e (ADW Developments, 2024)
7	Percentage of the new build development that will be made up of existing facades, structures, and buildings	The new build will include 0.3% of re-used material which could be exceeded if recommended items were re-used.
8	Summary of actions to achieve the WLC emissions report and the emissions reductions they are expected to achieve	This information can be found in the accompanying GLA WLCCA Template
9	Opportunities to further reduce the developments WLC emissions	This information can be found in the accompanying GLA WLCCA Template

Item	Detail	Further information
10	Complete of the 'material quantities and end-of-life' scenarios table covering all building element categories	This information can be found in the accompanying GLA WLCCA Template. This corresponds with the Bill of Materials in the Circular Economy Statement (Hodkinson Consultancy, 2024)
11	Completion of the 'GWP of all life-cycle modules table.	This information can be found in the accompanying GLA WLCCA Template

CONTENTS

1. INTRODUCTION

1.1 This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for the proposed development at Mary Fielding Guild Care home located at 103-107 North Hill, by Highgate Care Limited within the London Borough of Haringey has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Highgate Care Limited.

1.2 The proposed development will comprise the construction of a new 50 new care home and a new block of nine residential flats.

1.3 The purpose of this WLCCE assessment is to demonstrate that the proposed development at North hill Highgate has undertaken an initial assessment based on the information available to date which will need to be updated as the project progresses.

1.4 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.

1.5 The assessment of the proposed development endeavours to help the design team understand, at concept design stage, the lifetime consequences of their design decisions. This report 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 at 'Former' Mary Fielding Guild Care Home in the London Borough of Haringey is located at Highgate, London N6 4DP, as shown in Figure 1 below.

Figure 1: Site Location – Map data © 2021 Google

Existing Development

2.2 The site measures 0.374 hectares (0.9 acres) and it is occupied by a series of five interlinked buildings which wrap around the site in an L shape. The current Mary Feilding Guild Care Home is a registered care home for the elderly. The building has the main frontage on to North Hill to the east and a back entrance with parking spaces on to View Road to the south-east.

2.3 The existing care home is deemed to be no longer financially viable by the current operator. It fails to meet current space, facility and building regulation standards. The building does not offer Part M accessibility or Part B fire safety compliance in its current state. The existing home does not meet the needs or expectations for care in the Highgate area.

Proposed Development

2.4 The proposed development is described as follows:

"Demolition of existing buildings and redevelopment to provide a new 50-bed rehabilitation clinic (Class C2 – Residential Institutions) principally fronting onto and accessed from View Road together with a separate residential (Class C3 - Dwelling House) block fronting North Hill. This consists of 9 flats (5 x 1 bed; 3 x 2 bed and 1 x 3 bed)."

2.5 Figure 2 below illustrates the proposed site layout.

Figure 2: Proposed Ground Floor GA Plan (RM Design Group, March 2024)

2.6 The proposed development will comprise of a new care home consisting of 50 units in one building, and a second new building consisting of 9 residential flats.

Floor Area

2.7 The total Gross Internal Floor Area (GIA) for the proposed development is 4,479 m^2 total:

> Care Home, 3,792 m^2

> Residential Flats, 887 m^2

2.8 The principles noted within this report apply to this GIA.

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 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.

3.5 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.*

3.6 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

> Illustrative Landscape Masterplan - Guarda Landscape

> Cost Plan - John Cobb Consulting

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. This will be done at the proposed development to quantify the WLCCE that will be released, considering not only operational and embodied emissions but also demolition, construction, and refurbishment and replacement cycles.

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 proposed development using the cost plan provided by John Cobb Consulting (2024) and energy calculations from the Energy Statement submitted for planning (Hodkinson Consultancy, 2024).

4.8 A set of WLCCE 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. An 'aspirational' set of benchmarks have also been devised for applicants that wish to go further. Both sets of benchmarks are included in this assessment and are being reported on.

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 Simplified Building Energy Model (SBEM) for non-residential units.

> 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, 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 Care home has been calculated 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. They are presented as the landlord's energy demands at the Be Seen stage, in line with the London Plan Energy Hierarchy.

4.13 A sample shell only SBEM calculation has been carried out on the care home. 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 and therefore represent a fair aggregation of the unit mix of the site.

4.16 To provide energy demands across the entirety of the development, the accommodation schedule has been used to extrapolate the energy performance across the whole application area.

4.17 The unregulated energy demands, discussed further in *Be Seen*, 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.

Embodied Carbon

One Click LCA

4.18 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.

4.19 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.

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

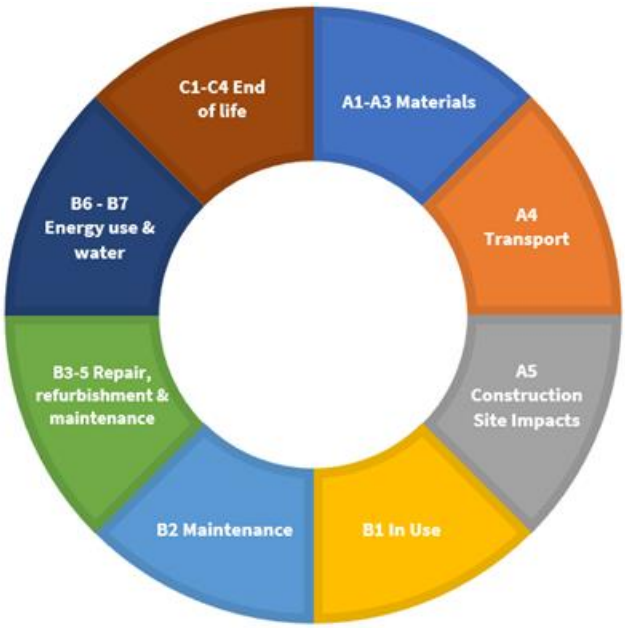

Figure 3: Life cycle modules

4.21 At this stage it is not expected that all the information will be available. Where this is the case, One Click has been used to calculate the required values for the assessment. As the design develops, we will update and refine the tool to reflect the quantity and types of materials being used.

Construction Impacts

4.22 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 project value has been provided by the Applicant, which has allowed the construction transport GHG emissions to be included.

Potable Water Use

4.23 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 external water use) and multiplied by the intended full occupancy of the development annually.

4.24 68 occupants have been assumed based upon the expected number of residents on site as per the Accommodation Schedule. This gives an estimated **annual water consumption of 2,730 m³** for the entire development for 60 years. An additional allowance has been added to the calculations for the ongoing water required for maintenance.

Carbon Sequestration

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

Data Sources

4.26 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)	A cost plan was provided by the Applicant so it can be confirmed that 95% of the cost allocated to each building element has been accounted for. Where there were unknowns (in terms of material types and quantities), One Click Carbon Designer was used.
Transport data (A4)	Default values provided by One Click.
Construction site impacts (A5)	Construction value provided by applicant and baseline target provided by BRE. Waste estimates were provided by the Applicant.
Refrigerants (B1)	Refrigerant quantity has been estimated based on a project of a similar size and scope as this detail is not yet known. This assumes an annual leakage of 2% and 1% end of life leakage rate with a 99% end of life recovery (as per TM65).

Data	Data source
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 figures based on Energy calculations by Hodkinson Consultancy (June, 2024).
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	Building areas were provided by the architect in the drawings – 4,479 m^2
Number of occupants	Care Home - 50 Residential - 16 Total - 66
Assessment period	60 years

4.27 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 which will need to be updated as the project progresses 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)

	Project kg CO_2/m^2	WLC Benchmark	Aspirational Benchmark
Modules A1 – A5	**525 kg CO_2e/ m^2 GIA**	<850 kg CO_2e/ m^2 GIA	<500 kg CO_2e/ m^2 GIA
Modules B – C (excluding B6 and B7)	**302 kg CO_2e/ m^2 GIA**	<350 kg CO_2e/ m^2 GIA	<300 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 graph above.

5.4 The total emissions, based on the GLA guidance is **827 kgCO_2/m^2 GIA over 60 years excluding sequestered carbon or 796 kgCO_2/m^2 when sequestered carbon is included.**

> 525 kgCO2/m2 for modules A1-A5 (excluding sequestered carbon).

> 302 kgCO2/m2 for modules B-C.

5.5 When operational energy and water emissions are included in the calculation above the total emissions are expected to be **2,374 kgCO_2/m^2 GIA over 60 years.**

5.6 A set of WLCCE 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. An 'aspirational' set of benchmarks have also been devised for applicants that wish to go further. Both sets of benchmarks are included in this assessment are being reported on.

5.7 The expected WLCCE are lower than the GLA WLC Benchmark for all modules, and the total emissions. 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:

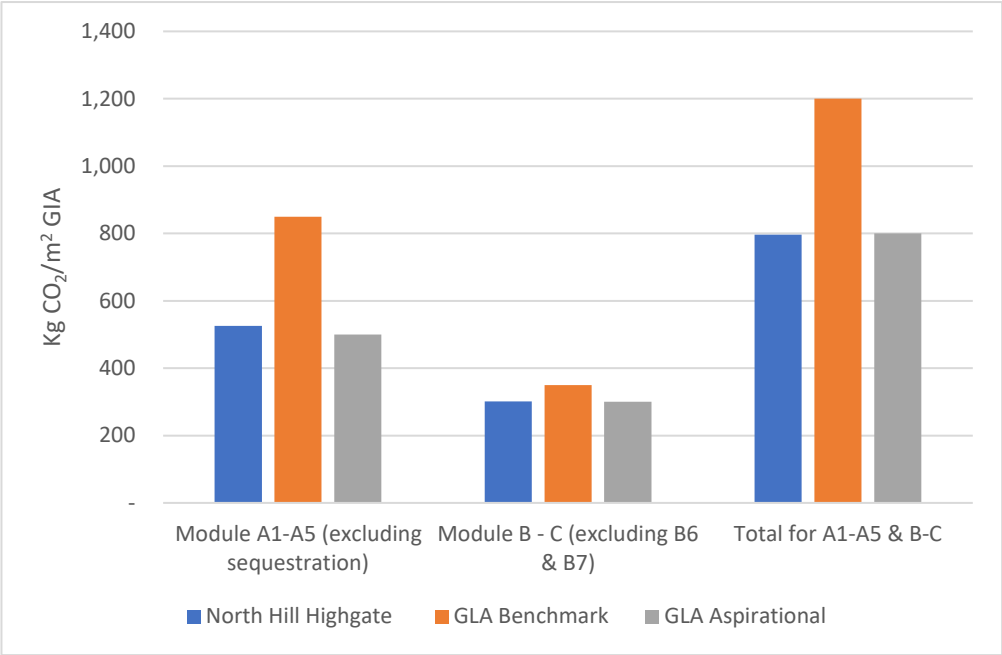

Figure 4: Total kgCO_2/m² GIA performance compared to GLA Benchmarks

5.8 These benchmarks will be subject to change as the WLCCE assessment gets updated in future. The full results are as follows:

Table 3: Full WLCCE Results

Category	Global warming potential	Total kgCO_2e over 60 years	Total kgCO_2e/m² GIA over 60 years
A1-A3	Construction Materials	2,065,476	461.14
A4	Transport	18,367	4.10
A5	Site operations	269,902	60.25
B1	In Use	172,921	39.60
B2	Maintenance	44,790	10
B3	Repair	11,198	2.5
B4	Replacement/Refurbishment	872,698	194.84
B6	Operational energy use	7,068,246	1578.08
B7	Operational water use	3,211	0.71

Category	Global warming potential	Total $kgCO_2e$ over 60 years	Total $kgCO_2e/m^2$ GIA over 60 years
C1-C4	End of life	249,726	55.76
	Total	**10,636,862**	**2,374.82**
	Carbon Sequestering	-139,713	-31.12
	TOTAL	**10,497,149**	**2,343.63**

5.9 The above results demonstrate that **10,497 tonnes** are expected to be emitted over a 60-year period.

5.10 The operational energy (B6) makes up 66% of the overall emissions for the proposed development; 41% for regulated energy use and 26% for unregulated use.

5.11 Materials (A1 – A3) make up 19% of the overall emissions. There has already been a big focus on material selection which is why this percentage share is not bigger. Further focus should be given to reduce embodied carbon, especially surrounding the façade and general structure of the building.

5.12 3% of emissions are a result from the transport of materials to site and construction stages (A4 and A5), 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 10% of all embodied carbon emissions. This is primarily due to materials that will need replacing over the 60 year study period.

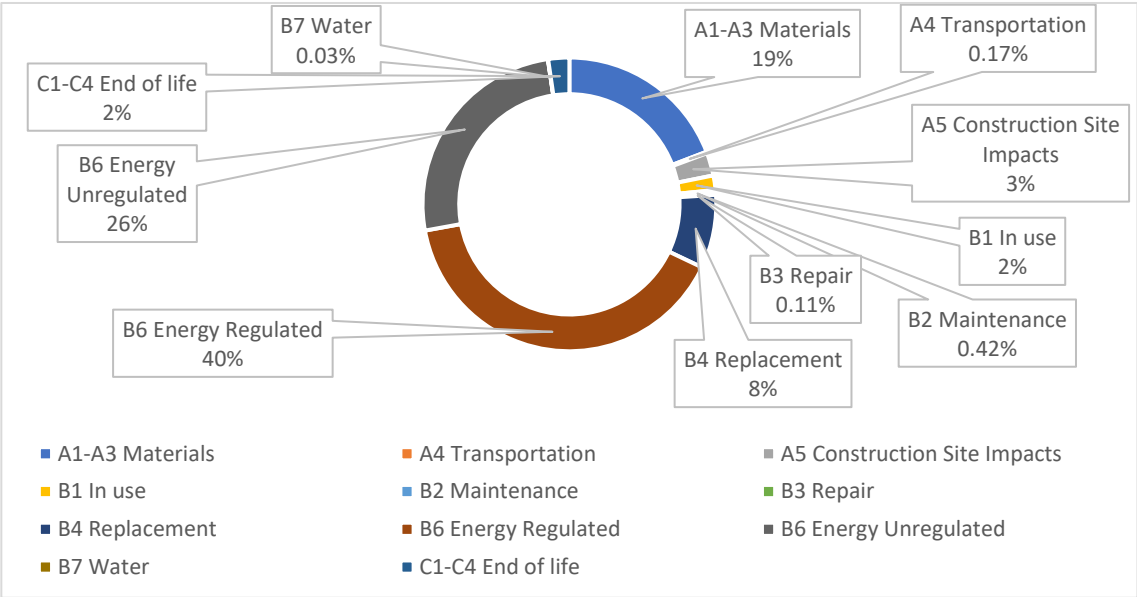

Figure 5: Total $kgCO_2e$ - Life-cycle stages

6. MEASURES IMPLEMENTED AND OPPORTUNIES

Measures Implemented

6.1 The proposed development has modelled potential measures throughout the design stage to further sustainability and reduce whole life carbon.

6.2 The specification of pre-cast planks for upper floor construction instead of in-situ concrete offers up to 10% saving in embodied carbon.

6.3 Specifying a high recycled content for steel is a good driver for products where the aim is to encourage and establish a market for recycled materials that are otherwise limited. Steel with 97% recycled content has been proposed for all floor constructions.

Opportunities

Reduce material use

6.4 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.

6.5 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.

6.6 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

6.7 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

6.8 **Innovative cement mixes** are now increasingly available and 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.

6.9 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.

6.10 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

6.11 The Circular Economy statement produced by Hodkinson Consultancy details the strategy for **recovery and reuse of materials**. Please refer to the report for further detail.

Sustainable procurement

6.12 The transportation of materials from the manufacturing facility to the building site adds to the carbon of the development. Buying from **local sources or utilising off-site manufacturing processes** could help reduce the emissions produced during transportation. There is a balance to be struck between material transport and processes deployed in their manufacture. As such, details on this cannot be known until the detailed design phase. This review would impact life cycle A4 - emissions from transportation to site.

6.13 **Sustainable/natural insulation materials** have lower embodied carbon and often increase biogenic carbon storage, which reduces the overall emissions of the development.

Building services

6.14 **Low energy building services** options serve to reduce WLCCE, impacting upon operational energy/water use, B6 and B7. Examples include:

> Increased PV for the production of heat/electricity;

7. CONCLUSION

7.1 This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for the proposed development at North Hill Highgate within the London Borough of Haringey has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Highgate Care Limited.

7.2 The purpose of this WLCCE assessment is to demonstrate that the proposed development North hill Highgate has undertaken an initial assessment based on the information available to date which will need to be updated as the project progresses.

7.3 The total emissions, based on the GLA guidance **is 827 $kgCO_2/m^2$ GIA over 60 years excluding sequestered carbon or 796 $kgCO_2/m^2$ when sequestered carbon is included.**

> 525 kgCO2/m2 for modules A1-A5 (excluding sequestered carbon).

> 302 kgCO2/m2 for modules B-C.

7.4 When operational energy and water emissions are included in the calculation above the total emissions are expected to be **2,374 $kgCO_2/m^2$ GIA over 60 years.**

7.5 The expected WLLCE are lower than the GLA WLC Benchmark for all modules, and the total emissions. This demonstrates that the development has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available.

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