Appendix: Greenhouse Gas Emissions

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VINEGAR YARD:

GHG EMISSIONS ASSESSMENT

for

ST THOMAS BERMONDSEY LIMITED

October 2021

ADAPT

SUSTAINABILITY CONSULTING

Version: 5
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Greenhouse Gas Emissions Assessment

1.0 Introduction

1.1 Project Overview

1.1.1 This Greenhouse Gas (GHG) Emissions Assessment report has been prepared by Adapt Sustainability Consulting Limited for land bounded by St Thomas Street and London Bridge Station (to the north), Vinegar Yard (to the south), Snowsfields (to the east) and Fenning Street (to the west). Vinegar Yard (the 'Proposed Development' - references to the Proposed Development throughout this document unless specified otherwise refer to the revised' October 2021 scheme) is accessed from St Thomas Street at the northern boundary and splits the area being redeveloped into two areas. The southern boundary extends to, and diverts to the south, before being bound by Melior Place which also forms the southern boundary. This assessment has been composed on behalf of St Thomas Bermondsey Limited (the 'Applicant').

1.1.2 The site covers a total area of approximately 0.3 hectares (ha). The existing site is occupied by two buildings in the south west portion of the site, and temporary food and drink stalls, retail units, a bar and events space along with art installations and art artist studios; this temporary use has required a number of temporary structures and external seating areas on site. The area is formed predominantly of hardstanding with very limited vegetation with the exception of a few trees along the southern border outside of the site boundary.

1.1.3 Redevelopment of the site is to include the demolition of existing buildings, retention and refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof) and 3 basement levels comprising of café and community space within the warehouse and within the new building office, flexible medical and research and development, and flexible retail and affordable workspace, alongside cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

1.1.4 The assessment was originally carried out in 2018 to provide GHG emissions information to inform a full (detailed) planning application for the redevelopment of an area of land within London Borough of Southwark (LBS). The assessment has now been updated to address the revised October 2021 scheme that seeks to provide flexible medical and research & development floorspace (Use Classes D1 and / or B1(b))designed to allow for occupation by Guys and St Thomas' NHS Foundation Trust, but flexible to ensure long term resilience. Levels one to ten of the building will first be offered to Guys and St Thomas' for use as either D1 medical space or B1(b) research & development. The remainder of the upper floors, levels 11 to 18, comprise a B1(a) office use. This configuration reflects Guys and St Thomas's Adaptable Estates Strategy, where buildings are able to accommodate a range of possible functions both physically and by virtue of permitted uses in the long term.

1.1.5 In the event that Guys and St Thomas' do not wish to occupy levels 1 to 10 of the proposed building, it will default to a B1(b) research and development use and will be made available to R&D occupiers whose work can support the SC1 Life Science & Innovation District. Minor changes to the plant configuration at levels 3 and 8 of the building and the retail floorspace at ground floor level would also change as a result of a research and development use. The remainder of the proposed

floorspace within the scheme would not change in the event of a research and development occupier taking the building.

1.1.6 To ensure a robust assessment has been made when considering the potential effects of the flexible nature of the end uses as discussed above, two versions of the scheme have been assessed in this GHG assessment and set out below as follows:

- Option 1: Where levels 1 - 10 of the Main Building are provided as D1 Use Class (medical use); and
- Option 2: Whereby levels 1 - 10 of the Main Building are provided as B1b Use Class (research and development use).

1.1.7 It is however expected that Option 1 and Option 2 would result in similar amounts of GHG emissions being emitted (in part due to the amount of available information at the time of writing) and therefore the report has assumed that the amount of GHG emissions being produced is considered to be the same for both Option 1 and Option 2 in lin with the Whole-Life Caron Assessment (WLCA). Where this differs for Option 1 or Option 2 this will be stated within the report.

1.1.8 In both options the remaining levels of the Main Building and Warehouse are provided as B1(a) Office, affordable workspace (B1 / D1), D1 (community) and A1-A4 (retail).

1.1.9 The Site is subject of a planning application by the Applicant (LBS/18/AP/4171) made to the LBS in December 2018 and subsequent addendum in June 2019. The December 2018 Application was supported by an Environmental Statement (ES) (herein referred to as the '2018 ES') which was prepared in accordance with the statutory procedures set out in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations'). The Application was considered by the LBS's Planning Committee on 29 June 2020. Officers recommended the Application for approval subject to conditions and S106, but LBS resolved to refuse the Application. On 24 August 2020, the Mayor of London notified the LBS and the Applicant of his intention to recover the Application for his own determination (GLA ref. GLA/6208/S2). Since then, the Applicant has been working with officers at the GLA to amend the Proposed Development, seeking amongst other changes to address LBS' heritage concerns that had led to the local refusal.

1.1.10 Scheme revisions were submitted to the GLA in December 2020, and Trium Environmental Consulting LLP (Trium) on behalf of the Applicant undertook an EIA of the Proposed Development as amended ('December 2020 scheme') and prepared an updated ES (December 2020 ES).

1.1.11 Since the submission of the December 2020 ES, there remained a few elements of the design that the GLA wanted to further consider and discuss and, therefore, the scheme has continued to evolve between January and September 2021 in response to ongoing feedback from both LBS and the GLA. Given the time period since the scheme was before the LBS Planning Committee, the suite of submission material has been comprehensively reviewed, updated and refreshed as necessary to take account of the scheme revisions and to ensure that the application materials are fully up to date with any changes to the adopted and emerging legislation and policy framework.

1.1.12 The December 2020 ES has, therefore, been updated to reflect the further amendments to the Proposed Development (October 2021 scheme).

1.1.13 As such, this report as part of the ES has been prepared as part of a package of materials for submission to the GLA for the purposes of public consultation and consideration of the October 2021 scheme (hereinafter referred to throughout this report as the revised 'Proposed Development' by the Mayor.

1.2 Overview of Environmental Impact Assessments (EIAs) & GHG Emissions Assessments

1.2.1 The EIA Directive transposed into national legislation from the 16th May 2017. The legislation requires a description of the likely significant effects of a project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of a project to climate change.

1.2.2 GHG emissions contribute to climate change by causing global warming, and increasing global temperatures are predicted to have severe adverse environmental, social and economic effects. To reduce the likely effects of climate change, the UK Government has set a target to reduce GHG emissions by 78% against 1990 levels by 2035 and to meet net zero carbon by 2050 with an aim of capping the global warming to 1.5 degrees above pre-industrial temperatures.

1.2.3 The built environment is a major contributor to GHG emissions and, according to the Committee on Climate Change ('CCC'), buildings were responsible for 18% of the UK's GHG emissions in 2019. Historically, within the built environment sector, emphasis has been placed upon reducing GHG emissions anticipated to arise from the operational use of electricity and gas. However, to meet the target set by the UK Government, a more comprehensive approach is needed to better understand how to reduce the embodied carbon impacts of new and existing buildings. RICS (2014) define embodied carbon as the carbon emissions associated with energy consumption (embodied energy) and chemical processes during the extraction, manufacture, transportation, assembly, replacement and deconstruction of construction materials or products.

1.2.4 The inclusion of an assessment of GHG emissions within an EIA allows for a greater understanding of the extent of GHG emissions arising from a new development and supports the identification of opportunities to optimise building performance.

1.3 GHG Emission Assessment of the Proposed Development

1.3.1 This report presents an assessment of GHG emissions expected to arise from the Proposed Development (assumed to be the same for both Option 1 and Option 2 unless stated otherwise) and an evaluation of their significance. The assessment has been undertaken in line with the Institute of Environmental Management and Assessment's (IEMA's) guide to 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2017), which recommends a framework of five steps to prepare a robust, appropriate and consistent assessment:

1. Define goal and scope of the GHG emissions assessment;
2. Set study boundaries;
3. Determine assessment methodology;
4. Collect the necessary calculation data; and
5. Calculate the GHG emissions inventory.

1.3.2 The prepared GHG emissions inventory has informed the decision making process in identifying the mitigation measures for the Proposed Development.

2.0 Relevant Legislation, Policy & Guidance

2.1 Introduction

2.1.1 Legislation, policy and guidance relevant to this assessment are set out below and provide context to the overarching aim and approach taken to determine and mitigate GHG emissions. Further details for the referenced legislation, policy and guidance are provided in Appendix A of this report.

2.2 National Legislation & Policy

- The Climate Change Act (2008)
- The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting (2018)
- National Planning Policy Framework (NPFF) (2021)
- Part L of the Building Regulations (2013) Conservation of Fuel & Power (including 2016 amendments)

2.3 Regional Policy & Guidance

- Greater London Authority (2021) The London Plan:
  - Policy GG6 Increasing efficiency and resilience;
  - Policy SI2 Minimising greenhouse gas emissions;
  - Policy SI3 Energy Infrastructure; and
  - Policy SI7 Reducing waste and supporting the circular economy.

2.4 Local Policy

- London Borough of Southwark (2011) - The Core Strategy.
  - Strategic Policy 13: High Environmental Standards;
  - Energy Policy
- London Borough of Southwark (2020): Submitted New Southwark Plan:
  - P12 Design Quality;
  - P61 Environmental Standards;
  - P62 Energy.

2.5 Industry Guidance

- British Standards Institute (BSI) (2011) EN 15978:2011 Sustainability of Construction Works. Assessment of Environmental Performance of Buildings;
- British Standards Institute (BSI) (2012) EN 15804:2012 + A2:2019 Sustainability of Construction Works. Environmental Product Declarations.
- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment;
- Institute Environmental Management and Assessment (IEMA) (2014) Position Statement on Climate Change and Energy;
- IEMA (2017) Assessing Greenhouse Gas Emissions and Evaluating their Significance;
- Publicly Available Specification (PAS) 2080 (2019) Guidance Document on Carbon Management in Infrastructure;
- Royal Institute of Chartered Surveyors (RICS) (2014) Methodology to Calculate Embodied Carbon;
- Royal Institute of Chartered Surveyors (RICS) (2017) Whole Life Carbon Assessment for the built environment (1st edition);
- UK Green Building Council (UKGBC) (2017) Embodied Carbon: Developing a Client Brief;

- Waste and Resources Action Programme (WRAP) (2011) Cutting Embodied Carbon in Construction Projects; and
- World Resources Institute (WRI) & World Business Council for Sustainable Development (WBSCD) (2005) The Greenhouse Gas Protocol for Project Accounting.

3.0 Methodology

3.1 Introduction

3.1.1 This section describes the methodology applied to completing this GHG emissions assessment. It has been undertaken in line with the IEMA guide to 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2017) and with other industry guidance referenced in sub-section 2.5. It is important to note that there is no singular industry approach to assessing GHG emissions and that there are many different approaches associated with the built environment sector. The IEMA guidance does not specify a particular approach, but rather sets out advice as to the key components necessary to deliver a robust, appropriate and consistent assessment.

3.2 Goal and Scope

3.2.1 The goal of this assessment is to complete a proportionate GHG emissions assessment of the Proposed Development, to determine any likely significant effects arising from GHG emissions and the requirement for any appropriate mitigation.

3.2.2 The scope of the assessment is reflective of the scheme proposals for the Proposed Development:
The demolition of existing buildings, retention and refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof) and 3 basement levels comprising of café and community space within the warehouse and within the new building office, flexible medical and research and development, and flexible retail and affordable workspace, alongside cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

3.2.3 Further details on the Proposed Development are presented within ES Chapter 4 - Proposed Development (Volume 1).

3.2.4 The GHG emissions inventory will include Scope 1, 2 and 3 emissions. A definition of each scope is provided below (adapted from the WBCSD WRI (2015): GHG Protocol: A Corporate Accounting and Reporting Standard):

- Scope 1: Direct GHG emissions arising from energy use (combustion) on site.
- Scope 2: Indirect GHG Emissions arising from the use of purchased electricity, heat or steam.
- Scope 3 Emissions: Other indirect (embodied) GHG emissions arising from third-party services and the production of materials, transportation, and disposal of waste.

3.3 Assessment/ Study Boundaries

3.3.1 A detailed and complete GHG emissions assessment typically covers all life cycle stages of a development. Figure 1 sets out the modular approach of the life cycle stages to be included. This is a simplified presentation of the modular approach provided by IEMA (2017) and is based on the BS EN 15978 standard.

3.3.2 It is recognised that covering all GHG emissions associated with a project is challenging, particularly in the earlier design stages and, therefore, IEMA (2017) place emphasis upon undertaking a proportionate and appropriate assessment to inform decision making and avoid undue burden to developers and regulators. Further information on the assumptions and limitations of the methodology are presented in sub-section 3.5 of this report.

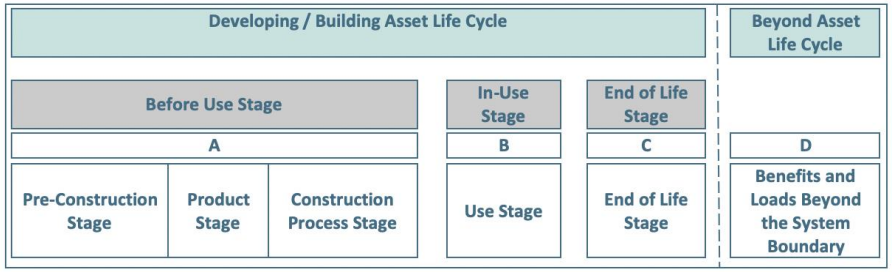

Figure 1: Modular approach to life cycle stages and modules for EIA GHG emissions assessments (adapted from IEMA (2017))

3.3.3 Module A is classified as the 'Before Use Stage' and includes emissions associated with pre-construction activities, products and the construction process.

3.3.4 Module B is classified as the 'Use Stage' and includes emissions associated with the operation of the Proposed Development.

3.3.5 Module C is classified as the 'End of Life Stage' and includes emissions associated with the de-construction and demolition of the Proposed Development.

3.3.6 Module D is classified as the 'Beyond Asset Life Cycle' and includes emissions associated with activities beyond the site boundary and life cycle of the Proposed Development. Module D is classified as an optional consideration, as it relates to the repurposing of discarded building elements or any energy recovered from beyond a project's lifecycle. It is not included in this assessment, as data to quantify this impact is limited until more detailed specifications and manufacturer information is available.

3.3.7 The assessment will consider the building components and works related to the Proposed Development, including external works within the site boundary. For the purposes of this assessment, the site boundary for the Proposed Development remains consistent with that assessed within the EIA. For further information on the Proposed Development and the site boundary, refer to ES Chapter 1: Introduction and Chapter 4: The Proposed Development (Volume 1).

3.3.8 The Reference Study Period (RSP) for the assessment is 60 years. This RSP is the most commonly referenced within industry guidance including within the RICS (2017) Whole Life Carbon Assessment for the Built Environment (1st edition) and BS EN 15978 (2011).

3.3.9 The RSP will be considered in conjunction with the demolition and construction programme of the Proposed Development. In summary, the enabling works, demolition and construction will take circa 36 months to complete, with expected completion during 2025. For further detail, refer to ES Chapter 5: Demolition and Construction (Volume 1).

3.4 Calculation Methodology

3.4.1 The quantification of GHG emissions for an EIA can be either measured or calculated, or a combination of both. Within this assessment, emissions have been calculated, as the exercise is taking place in advance of any supply chain mobilisation or construction works associated with the Proposed Development. The calculation for determining GHG emissions is based upon the multiplication of relevant emission factors with the activity responsible for producing the GHG emissions.

3.4.2 For example:
Electricity consumed (kWh) x electricity emission factor (tCO_2e per kWh) = total tCO_2e

3.4.3 GHG emissions will be reported using the following units: tonnes of carbon dioxide equivalent (tCO_2e).

3.4.4 A universal database is not available for the sourcing of GHG emission factors and benchmarks. Therefore, a range of industry sources are used to compile the inventory. References to the sources for emission factor data are provided within Appendix B of this report.

3.4.5 A Whole-Life Carbon (WLC) Assessment has been undertaken for the Proposed Development in accordance with London Plan Policy SI2. One Click LCA software has been utilised to estimate emissions. This software refers to industry guidance and is alignment with the GLA 'Whole Life-Cycle Carbon Assessments guidance, Pre-consultation draft' (April 2020). The WLC assessment follows the same 'module-based' approach set out in Figure 1, where GHG emissions are assessed for Modules A, B, C & D.

3.5 Limitations of the Assessment

3.5.1 This assessment has been undertaken at RIBA (Royal Institute of British Architects) Stage 2, typically referred to as the 'Concept Design' stage. During this stage, outline proposals for the structural design, building services systems, outline specifications and preliminary cost information is produced. Therefore, this assessment is based on the indicative information available at this stage of the Proposed Development. This reduces the level of accuracy of the assessment. However, by using industry benchmarks and preliminary modelling results, the results of the assessment can provide insight as to the priority areas for reducing the impact of GHG emissions resulting from the Proposed Development.

3.5.2 Emissions associated with the transport of the delivery of goods to the site are typically a material consideration for large-scale developments. At this early stage of the Proposed Development, it is challenging to determine a meaningful calculation of the associated transport emissions, as a greater understanding of where these goods originate from is required (e.g. the distance from the supplier's 'gate' to site). This assessment could be regularly reviewed throughout the later stages of the design (i.e. detailed design stage of the Proposed Development) to replace benchmark and estimated data with the actual design and product information, reflective of the final development.

3.5.3 The Proposed Development will be car-free with the exception of 2 disabled parking bays. Both with be located off-site adjacent to the scheme. Car journeys are anticipated to be low and are therefore not included in this assessment.

3.5.4 Within the 'Baseline' and 'In-Use' calculations, current carbon factors have been used to determine the GHG emission impact of predicted energy usage. However, future energy projections indicate that the carbon intensity of energy generated by the National Grid may reduce as cleaner energy sources replace more carbon-intensive methods such as coal-based generation. The National Grid Future Energy Scenarios (2020) predicts that there will be a significant increase in renewable energy generation in the electricity infrastructure. To account for this, the assessment applies two scenarios;

1. SAP 10 emission factors
2. Future Energy Scenario 2050

3.6 Assessment of Effects

3.6.1 To achieve a consistent approach across the different technical disciplines addressed within the EIA process, technical assessments broadly define the sensitivity of the receptors that could be affected by the Proposed Development and the magnitude of impact to derive the scale of a resultant effect. As a general rule, the following applies: 'moderate' or 'major' effects are deemed to be 'significant'; whereas 'minor' and 'negligible' effects are 'not significant'.

3.6.2 A generic matrix that combines the sensitivity of the receptor and the magnitude of impact to identify the resultant effect is provided within Table 1.

Receptor Sensitivity	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Table 1: Scale of Effects

3.6.3 In terms of defining significance, guidance from IEMA has been adopted, which has identified three underlying principles to inform the assessment of significance, as follows:

- The GHG emissions from all projects will contribute to climate change; the largest interrelated cumulative environmental effect;
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g. population, fauna, soil, etc.; and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.

3.6.4 For the majority of development projects, the individual contribution to total GHG emissions (from local through to global scale) will be very small; however, the IEMA guidance recognises that the contribution of GHG emissions to climate change is a cumulative global issue, and as such it is important for developments of all scales to acknowledge the significance of any increases in GHG emissions, and that the EIA should ensure the project addresses their occurrence by taking mitigating action.

4.0 GHG Emissions Assessment

4.1 Baseline

Current Baseline

4.1.1 Within the context of this GHG emissions assessment, the baseline is a reference point against which the impact of the Proposed Development can be compared against. Typically, the baseline would be calculated by determining the GHG emissions arising from operations on the existing site.

4.1.2 The existing site is formed predominantly of hardstanding, with one building currently on site in the south west corner and very limited vegetation with the exception of a few trees along the southern border outside the site boundary.

4.1.3 During the original planning submission in 2018 the site was vacant. In the interim, the site has been provisionally occupied by market retailers, food and beverage vendors and a community performance space. GHG emissions arising from the site are deemed to be low and temporary and are therefore not included in the calculation for this assessment. The baseline for this updated assessment therefore remains consistent with that used in the 2018 assessment – a vacant site. This reflects a conservative assessment approach as no baseline emissions are taken into account when determining the estimated net emissions for the Proposed Development.

4.2 Proposed Development WLCA

4.2.1 A Whole-Life Carbon (WLC) Assessment has been undertaken for the Proposed Development in accordance with London Plan Policy SI2. The policy sets out a requirement for development to calculate and reduce whole life carbon emissions.

4.2.2 A summary of the WLC assessment for both Option 1 and Option 2 results are provided below for each of the module stages stated in section 3.3 of this report. For further details, please refer to the 'Vinegar Yard GLA WLC Assessment Template – Rev 03' (Sweco, Oct 2021).

4.3 Module A: Before Use Stage

Product Stage

4.3.1 GHG emissions will arise from the manufacture of construction products and materials, often referred to as embodied emissions. These are emissions that arise from the energy used in extracting materials, refining them (i.e. primary manufacture), transporting and processing them, to producing a finished product.

4.3.2 The estimated 'cradle-to-gate' GHG emissions arising from products/materials to be used in the Proposed Development are 18,394 tCO_2e (for both Option 1 and Option 2). The OneClick LCA tool, which has an extensive catalogue of WLC data for consutrction materials has been utilised to calculate the estimate emissions impact.

4.3.3 Increasingly, product/material manufacturers are producing reports detailing actual 'cradle-to-gate' emissions and also produce industry recognised Environmental Product Declarations (EPD). It is recommended that as the technical design and specification of the Proposed Development progresses, more accurate information should be sought from suppliers to replace any product and material assumptions.

Construction Stage

4.3.4 GHG emissions will arise from activities carried out to prepare the site for the Proposed Development. Construction-related equipment will be installed on-site to undertake the demolition, enabling and construction activities. As a result of these activities, GHG emissions will arise from energy used for site equipment and from the transport and treatment of waste and materials. These emissions are considered within the assessment model and are estimated to be 3,291 tCO_2e (for both Option 1 and Option 2).

4.4 Module B: In-Use Stage

4.4.1 Once the construction of the Proposed Development (under both Option 1 and Option 2) is complete, GHG emissions will arise from a number of sources, including;

- Use of components such as refrigerants, insulation, blowing agents and paints, carbonation relating to cementious materials and carbon withdrawals;
- Maintenance, repairs, replacements and refurbishment; and
- Operational energy and water use.

4.4.2 The estimated GHG emissions arising from the use stage are shown in Table 2.

Use Stage	GHG Emissions (tCO_2e)
Refrigerants, Carbonation, Carbon withdrawals	5,679
Maintenance, repair, replacements and refurbishment	7,670
Operational energy use	6,470
Operational water use	1,835
Total	21,654

Table 2: Use Stage GHG Emissions (for both Option 1 and Option 2)

Energy Consumption

4.4.3 In-use energy demand GHG emissions will arise as a result of energy being used for technical building services including heating, cooling, hot water, and ventilation, as well as for occupier equipment such as cooking appliances, computers, and refrigeration. Energy used for technical building services is referred to as regulated energy and energy used for uncontrolled occupier equipment is referred to as unregulated energy.

4.4.4 An Energy Strategy and Sustainability Statement has been prepared for the Proposed Development by Sweco (October, 2021). The Statement summarises the design measures considered to improve energy performance and embed sustainability practices. The Energy Strategy includes Standard Assessment Procedure (SAP) modelling to demonstrate compliance with Building Regulations Part L1A 2013, and it includes a description of the design considerations to meet the energy requirements set out in the GLA London Plan (2021) and the LBS Local Plan (2018).

4.4.5 At present, there is no district heating network which the Proposed Development could connect to immediately. CHP units were not considered for the Proposed Development due to the facts below:

1. The Proposed Development aims to have no on-site combustion engine sources as the main energy supply to significantly contribute to improving local air quality (back up diesel generators are however required);
2. The decarbonization of the grid, with increased share of renewable energy in the mix, make the on-site generation from natural gas fuelled CHPs a more carbon-intensive process; and
3. Exporting electricity to the grid will not be an economically viable solution for this development.

4.4.6 Ventilation, lighting services and small power usage will be met by grid electricity and renewable energy. Additionally, a Variable Refrigerant Flow (VRF) Air Source Heat Pump (ASHP) will be used to provide heating and cooling for the pavilion building. The hybrid operation and the ability to provide heat recovery will increase the sessional efficiency of the units.

4.4.7 A review of renewable technologies has been carried out for the Proposed Development and it is proposed that façade and roof-mounted photovoltaic (PV) panels will provide approximately 35,000kWh of electricity per annum.

4.4.8 The results of the energy modelling are presented in Table 3 (Option 1) and Table 4 (Option 2). It is estimated that the Proposed Development will achieve a Regulated carbon dioxide saving of 57% relative to a New-Build Part L2A 2013 compliant development under Option 1 and a Regulated carbon dioxide saving of 55% under Option 2.

	Carbon Dioxide Emissions (tCO_2 per year)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	302.0	378.6
Predicted Performance After Proposed Savings	130.0	302.9

Table 3: Predicted annual carbon emissions for Proposed Development (Option 1)

	Carbon Dioxide Emissions (tCO_2 per year)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	281.9	379.9
Predicted Performance After Proposed Savings	126.6	303.9

Table 4: Predicted annual carbon emissions for Proposed Development (option 2)

4.4.9 It is expected that the carbon intensity of grid electricity will decrease over time as more efficient and renewable sources are incorporated within the energy industry. On this basis, the GHG emissions associated to operational energy use are likely to be less than that stated above over the long-term.

Water Consumption

4.4.10 The Proposed Development will seek to incorporate water efficient design measures to minimise the water consumption. The measures include fitting water efficient sanitary ware and water meters to facilitate usage monitoring and water consumption target setting. The meters will be connected to the BMS and leak detection systems will be provided.

4.4.11 Assuming that the Proposed Development is operational for 60 years the predicted emissions associated to water consumption are 1,835 tCO_2e (for both Option 1 and Option 2).

Transport

4.4.12 The site is highly accessible to public transport, being located adjacent to London Bridge Station which benefits from London Underground services (Jubilee and Northern Lines) and National Rail services. Additionally, the local area is served by a number of bus routes with stops along St Thomas Street, at London Bridge station and on Tooley Street and is close to national cycle routes and the Cycle Superhighway. It is estimated that 99% of transport to the Proposed Development will be via public transport, by bicycle or on foot. The remaining 1% is expected to arise by the use of motorcycles and taxis. On this basis, it is anticipated that emissions arising

from vehicle use will have a low impact on the GHG emission inventory (less than 1%).

4.5 Module C: End-of-Life Stage

4.5.1 When the Proposed Development has reached the end of its life and will no longer be in use (assumed this will be in Year 60), GHG emissions will arise from the decommissioning, stripping out, disassembly, deconstruction and demolition activities, as well as from the transport, processing and disposal of materials of the built assets.

4.5.2 The End-of-Life stage emissions are estimated to be -712 tCO_2e (for both Option 1 and Option 2).

4.6 Module D: Benefits & Loads Beyond the System Boundary

4.6.1 In the future there is potential for building components within the Proposed Development to be repurposed through recovery, reuse or recycling activities. As a result, there may be avoided emissions. The GHG emission benefits from the Proposed Development over the life cycle are estimated to be -19,606 tCO_2e (for both Option 1 and Option 2).

4.7 Summary of Estimated GHG Emissions

4.7.1 The total estimated GHG emissions for the Proposed Development (for both Option 1 and Option 2) from Pre-Construction Stage to End-of-Life Stage are 44,050 tCO_2e. This calculation is based on the low 'In-Use' scenario. Table 5 presents a breakdown of GHG emissions by stage.

Stage	Total tCO_2e
Before Use Stage	21,685
In-Use Stage	21,653
End of Life	712
Total	44,050

Table 5: Proportion of Estimated GHG Emissions by Module/Stage (based on FES 2050 scenario)

5.0 Assessment of Significance & Mitigation

5.1 Assessment of Significance

5.1.1 In order to contextualise the contribution of GHG emissions anticipated to arise from the Proposed Development, the approach is to compare against an existing carbon budget to determine a sense of scale of the emissions. It is widely accepted that an EIA should focus on a Proposed Development's significant impacts. Typically, there is an established approach to determining significance in an assessment, however, with regards to the assessment of GHG emissions, a defined threshold or significance criteria does not exist.

5.1.2 The UK National Carbon Budgets are projected to 2037 and represent the target future GHG emissions at a national level. Table 6 presents the relevant UK Carbon Budget data in relation to the emissions anticipated to arise from the Proposed Development. Emissions associated to the 'Before Use' stage (demolition, enabling and construction works) will fall within the third and fourth carbon budget and the 'In-use' stage emissions will fall within the fourth, fifth and sixth budgets. The IEMA (2017) guidance advocates that GHG emissions are always considered and reported but at varying degrees of detail depending on the EIA of the project. Furthermore, in the absence of significance criteria and on the basis that GHG emissions will contribute to climate change, and climate change being recognised as the largest inter-related cumulative environmental effect, IEMA recommend that any GHG emissions arising from a project are to be considered as 'significant' when considered cumulatively at a global level .

Carbon Budget	Carbon Budget Level (MtCO2e)	Estimated GHG Emissions Arising from Proposed Development (tCO2e)	% of Carbon Budget
3rd 2018-2022	2,544	0	<0.0005%
4th 2023-2027	1,950	22,767	<0.0015%
5th 2028-2032	1,725	1,804	<0.0005%
6th 2033-2037	965	1,804	<0.0005%

Table 6: UK National Carbon Budgets

5.1.3 The GHG emissions of the Proposed Development (for both Option 1 and Option 2) do not account for more than 1% of each of the UK carbon budgets and therefore the impact of the Proposed Development to meet the national target to reduce emissions by at least 78% of 1990 levels by 2035 is deemed to be low.

5.2 Mitigation

5.2.1 To mitigate climate change, GHG emissions must be reduced. This can be best achieved by considering a GHG emission hierarchy as illustrated in Figure 3. This hierarchy is adapted from the IEMA (2014) 'Position Statement on Climate Change and Energy' and starts with first avoiding or reducing emissions where practical, before suggesting offset or sequester strategies beyond this. The practical outcomes of applying these principles will differ depending on the attributes of the project. However, to make a notable positive impact, the hierarchy needs to be considered in the early decision-making stages of a project.

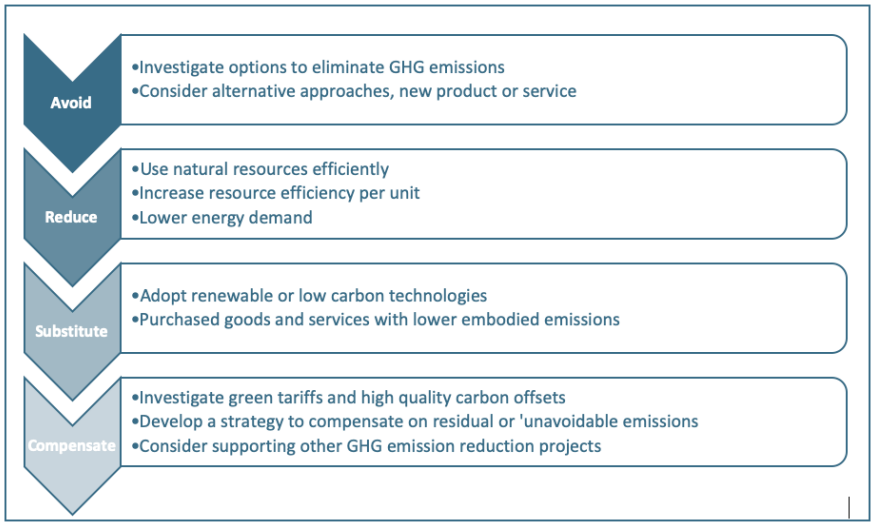

Figure 3: The Greenhouse Gas Management Hierarchy (Adapted from IEMA (2014) Position Statement on Climate Change and Energy)

5.2.2 Throughout the early stages of the design, (RIBA Stages 1-2) mitigation measures to reduce the environmental impact, and specifically the GHG emission impact of the Proposed Development, have been considered by the Design Team. The mitigation measures are summarised in Table 6. Further detail on these measures can be found in the 'Energy & Sustainability Statement' (Sweco, October 2021) and in the ES Chapter 15: Mitigation and Monitoring Schedule (Volume 1).

Stage	Mitigation Measures
Before Use Stage	Materials with Low Embodied Impact: The LBS SPD's standards regarding sustainable materials specification and procurement include: Avoidance of insulation materials containing harmful substances which contribute to stratospheric ozone depletion; A preferred standard to specify at least 75% of main elements of the building to achieve A rating in the BRE Green Guide to Specification; Use of low emission finishes, construction materials, carpets and furnishings; Maximising the use of recycled construction materials; Use prefabricated and standardised modulation to minimise material waste; Prepare a green procurement plan detailing how construction materials will be sustainably sourced; 50% of construction materials by mass to be sourced within 35 miles of the site.
	Material Efficiency: Opportunities and measures to optimise the use of materials in building design, procurement, construction, maintenance and end of life will be identified within a materials efficiency plan in alignment with the BREEAM criteria
	Fabric Design: Specification of building materials considered fabric efficiency to reduce heating and cooling loads.
	Overheating: Building orientation, percentage of glass and shading devices on the façade have been designed with the aim to minimise solar heat gains entering the building.
	Re-use of Material: Wherever possible, the design will incorporate the use of RCA (recycled concrete aggregate) up to a maximum mass faction of 20 % according with the BS8500-1; 10% total value of materials to be derived from recycled and reused content in products and materials selected.
In-Use Stage	Energy Efficient Lighting Control: Introducing presence detection and daylight dimming within spaces which have access to daylight will reduce the lighting levels for times when the lux levels are available via natural daylight. Furthermore, LED lighting will be required to achieve predicted lighting levels. All luminaires will be provided with dimmable control gear (addressable) to suit its type and application.
	Energy Efficient Ventilation: The development achieves a comfortable environment under a mixed mode ventilated scenario. It is estimated that a saving of 19.6% on cooling energy will be achieved through the use of free cooled outside air to ventilate the spaces during mid-season and night-time in compliance with GLA cooling hierarchy due to the use of passive measures.

	Low Carbon Technology: Façade and roof mounted PV panels will enable on-site electricity generation and are expected to provide 35,000kWh/year; Energy efficient and low carbon technology with passive design to be incorporated into the development.
	Building Management System: This will fully control, monitor and record the various mechanical, electrical and public health systems in addition to fully monitoring the energy usage through installing local energy monitors. The building manager will be able to record energy usage and identify where additional energy savings can be made.
	Low GWP Refrigerants: Any systems using refrigerants will have Direct Effect Life Cycle CO2 equivalent emissions (DELC CO2e) of ≤ 1000 kgCO2e/kW cooling/heating capacity. Additionally, where air-conditioning or refrigeration systems are to be installed the refrigerants used have a Global Warming Potential (GWP) ≤10.
	Low Zero NOx Emissions: The plant to be installed to meet the building's delivered heating and hot water demand will have zero NOx emissions.
	Water Consumption: The Proposed Development will seek to incorporate water efficient design measures including water efficient sanitary ware, water meters and a leak detection system. The meters will be connected to the BMS. There is a target to achieve a 45% reduction in water use from the baseline set by the Building Research Establishment for this building type.

Table 6: Mitigation Measures

6.0 Conclusion

6.1.1 The IEMA principles on climate change mitigation and EIA identify climate change as one of the defining environmental policy drivers of the future, and that action to address GHG emissions is essential.

6.1.2 The principles are based on the following considerations:

- All projects create GHG emissions that contribute to climate change;
- Global climate change has the potential to lead to significant environmental effects; and
- There is a carbon budget that defines a level of dangerous climate change whereby any GHG emission within that budget can be considered as significant.

6.1.3 The purpose of this assessment has been to quantify the anticipated GHG emissions and contextualise the project's contribution to an existing carbon budget. Based on the assessment undertaken, the contribution of emissions in the context of the budget are deemed to be low. As demonstrated in Section 5, the arising GHG emissions represent a small proportion of national GHG emissions and by the adoption of mitigation measures, as well as continuing decarbonisation of the energy network, it is anticipated that emissions will be reduced over time.

6.1.4 As a result, IEMA (2017) recommend that all GHG emissions, including any residual emissions following adoption of any mitigation measures, are to be determined as significant when considered cumulatively at a global level.

6.1.5 As stated in Section 4.7, the total estimate of GHG emissions for the Proposed Development under both Option 1 and Option 2 over the 60-year RSP is 44,050 tCO_2e. Table 5 demonstrates that GHG emissions associated with the product and construction stage currently represent the largest contributor to GHG emissions throughout the lifecycle of the Proposed Development. To reduce these emissions, over the course of the ongoing detailed design, opportunities to specify products and materials with lower embodied carbon impacts will be considered.

7.0 On-going Assessment

7.1 Updating the GHG Assessment

7.1.1 This assessment is reflective of the design information available at RIBA Stage 2, concept design. Additional detail in the design and specification of the Proposed Development will become available as the project progresses. For example, during the tender process, a Principal Contractor may identify and suggest alternative construction materials or methodologies that may reduce or increase the emission impact. The GHG emission assessment could therefore be updated at each RIBA stage to account for any changes and allow for the identification/adjustment of mitigation activities where appropriate.

Appendix A: Summary of Relevant Legislation, Policy & Guidance

National Legislation & Policy

The Climate Change Act (2008)

The Climate Change Act (2008) is the basis for the UK's approach to tackling and responding to climate change. Through the Climate Change Act, a target to significantly reduce the UK Greenhouse Gas emissions by 2050 has been set. The Act commits the UK Government by law to reduce GHG emissions by at least 80% of 1990 levels by 2050. It also establishes a framework to deliver these requirements.

The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting (2018)

The National Adaptation Programme (NAP) sets the actions that government and others will take to adapt to the challenges of climate change in the UK. It sets out key actions for the next 5 years. The report also details how we will manage the third cycle of adaptation reporting. This report forms part of the five-yearly cycle of requirements laid down in the Climate Change Act 2008.

National Planning Policy Framework (NPPF) (2019)

The National Planning Policy Framework (NPPF) came into force with the aim of making the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The government states that at the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a principle thread running through both plan-making and decision-taking.

- Chapter 9. Promoting sustainable transport
  - Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:
    - the potential impacts of development on transport networks can be addressed;
    - opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;
    - opportunities to promote walking, cycling and public transport use are identified and pursued;
    - the environmental impacts of traffic and transport infrastructure can be identified, assessed and considered – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and
    - patterns of movement, streets, parking and other transport considerations are integral to the design of schemes, and contribute to making high quality places.

- Chapter 11. Making effective use of land
  - An effective use of land should be considered in meeting the need for homes and other uses, while safeguarding and improving the environment, ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.

- Chapter 14. Meeting the challenge of climate change, flooding and coastal change
  - The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) 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.

  - Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
    - take account of advice from lead local flood authority
    - have appropriate proposed minimum operational standards
    - have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development
    - where possible, provide multifunctional benefits

- Chapter 15. Conserving and enhancing the natural environment
  - Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;
c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;
d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;
e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Consideration of such applications should include an assessment of:
a) the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;
b) the cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and
c) any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated.

Part L of the Building Regulations (2013) Conservation of Fuel & Power

Part L of the Building Regulations (2013) Conservation of Fuel & Power provides guidance on how to comply with the energy efficiency requirements of the Building Regulations. It requires that reasonable provision shall be made for the conservation of fuel and power in buildings by:

- Limiting heat gain and losses -
  - through thermal elements and other parts of the building fabric; and
  - from pipes, ducts and vessels used for space heating, cooling and hot water services;
- Providing fixed building services which -
  - are energy efficient
  - have effective controls; and
  - are commissioned by testing and adjusting as necessary to ensure they use no more fuel or power than is reasonable in the circumstances.

Regional Policy & Guidance

Greater London Authority (2021) The London Plan 2021

The London Plan was adopted in 2021. The two policies relating to this assessment are summarised below;

- Policy GG6 Increasing efficiency and resilience
  - To help London become a more efficient and resilient city, those involved in planning and development must:
    - seek to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero-carbon city by 2050.
    - ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, and avoiding contributing to the urban heat island effect.
    - create a safe and secure environment which is resilient against the impact of emergencies including fire and terrorism.
    - take an integrated approach to the delivery of strategic and local infrastructure by ensuring that public, private, community and voluntary sectors plan and work together.
- Policy SI2 Minimising greenhouse gas emissions
  - Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the energy hierarchy.
  - Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance.
  - In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim to achieve 10 per cent, and non-residential development should aim to 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:
    - through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or
    - off-site provided that an alternative proposal is identified and delivery is certain.
- Policy SI3 Energy Infrastructure
  - Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy requirements and infrastructure arising from large-scale development proposal
  - Energy masterplans should be developed for large-scale development locations which establish the most effective energy supply options.
  - Development Plans should:

- identify the need for, and suitable sites for, any necessary energy infrastructure requirements including upgrades to existing infrastructure
- identify existing heating and cooling networks and opportunities for expanding existing networks and establishing new networks.

- Major development proposals within Heat Network Priority Areas should have a communal heating system.

- Policy SI7 Reducing waste and supporting the circular economy
  - Waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by:
    - promoting a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible
    - encouraging waste minimisation and waste avoidance through the reuse of materials and using fewer resources in the production and distribution of products
    - ensuring that there is zero biodegradable or recyclable waste to landfill by 2026
    - meeting or exceeding the recycling targets for each of the following waste streams and generating low-carbon energy in London from suitable remaining waste:
      - municipal waste – 65 per cent by 2030
      - construction, demolition and excavation waste – 95 per cent by 2020
    - designing developments with adequate and easily accessible storage space that supports the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.
  - Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted, to demonstrate:
    - how all materials arising from demolition and remediation works will be re-used and/or recycled
    - how the proposal's design and construction will enable building materials, components and products to be disassembled and re-used at the end of their useful life
    - opportunities for managing as much waste as possible on site
    - adequate and easily accessible storage space to support recycling and re-use
    - how much waste the proposal is expected to generate, and how and where the waste will be handled.

Greater London Authority (2014) Supplementary Planning Guidance: Sustainable Design and Construction

To support the policies in the London Plan the Sustainable Design and Construction SPG includes guidance on:

- energy efficient design
- meeting the carbon dioxide reduction targets
- decentralised energy
- how to offset carbon dioxide where the targets set out in the London Plan are not met
- retro-fitting measures
- support for monitoring energy use during occupation
- an introduction to resilience and demand side response
- air quality neutral
- resilience to flooding
- urban greening
- pollution control
- basements policy and developments
- local food growing

Local Policy

London Borough of Southwark (2011) - The Core Strategy

- Strategic Policy 13 – High Environmental Standards

  Carbon emissions from new and existing development will be reduced by the following measures:

  1. Requiring all new development to be designed and built to minimise greenhouse gas emissions across its lifetime.
  2. Recycling or reusing 95% of construction, excavation and demolition waste by 2020.
  3. Designing all developments so that they require as little energy as possible to build and use.
  4. Expecting all major developments to set up and/or connect to local energy generation networks where possible.
  5. Reduce CO2 emissions across Southwark by 80% over 2005 levels by 2050.
  6. Enabling existing buildings to become more energy efficient and make use of low and zero carbon sources of energy.
  7. Setting high standards and supporting measures for reducing air, land, water, noise and light pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work. This includes making sure developments are designed to cope with climate conditions as they change during the development's lifetime.
  8. Residential development should achieve at least Code for Sustainable Homes Level 4.
  9. Community facilities, including schools, should achieve at least BREEAM "very good".
  10. New health facilities must be BREEAM "excellent" and any refurbishment should achieve BREEAM "very good."
  11. All other non-residential development should achieve at least BREEAM "excellent".

12. Major development should achieve a 44% saving in carbon dioxide emissions above the building regulations from energy efficiency, efficient energy supply and renewable energy generation.
13. Major development must achieve a reduction in carbon dioxide of 20% from using on-site or local low and zero carbon sources of energy.
14. Major development must reduce surface water run-off by more than 50%
15. Major housing developments must achieve a potable water use target of 105 litres per person per day.

- Energy Policy

  The following are key objectives for the London Borough of Southwark for local policy to address. These are broadly based on the Energy Hierarchy principles of: reduce consumption, produce or use energy efficiently, generate energy cleanly.

  1) Reducing Energy Consumption
  2) Improvement of Existing Housing Stock
  3) Generate Energy Locally
  4) Decarbonising Heating
  5) Decarbonising Electricity
  6) Improving Air Quality
  7) Fuel Poverty
  8) Promotion of low carbon transportation

London Borough of Southwark (2017) New Southwark Plan: Proposed Submission Version

The revised London Borough of Southwark Local Plan is expected to be published in 2019.

- P12 – Design Quality

  Development must provide:

  1. High standards of design with appropriate fabric, function and composition; and
  2. Innovative design solutions that are specific to the site's historic context, topography and constraints; and
  3. Adequate daylight, sunlight, outlook and a comfortable microclimate for new and existing neighbouring occupiers; and
  4. Respond positively to the context using durable, quality materials; and
  5. Buildings and spaces which are constructed and designed sustainably; and
  6. Buildings and spaces that utilise active design principles that are fitting to the location, context, scale and type of development; and
  7. Active frontages and entrances that promote activity and successfully engage with the public realm in appropriate locations; and
  8. Adequate servicing within the footprint of the building and site for each land use; and
  9. Accessible and inclusive design for all; and
  10. A positive pedestrian experience; and
  11. Basements that do not have adverse archaeological, amenity or environmental impacts.

- P61 – Environmental Standards

  Development must:

12. Achieve a BREEAM rating of 'Excellent' for major non-residential development and non-self-contained residential development over 500sqm;
13. Achieve BREEAM rating of 'Excellent' in domestic refurbishment for conversion, extension and change of use of residential floorspace over 500sqm;
14. Achieve BREEAM rating of 'Excellent' in non-domestic refurbishment for conversion, extension and change of use of non-residential floorspace over 500sqm;
15. Reduce the risk of overheating, considering climate change predictions over the life time of the building, in accordance with prioritised measures set out in the following cooling hierarchy:
    - Minimise internal heat generation through energy efficient design
    - Reduce the amount of heat entering a building through the orientation, shading, albedo, fenestration, insulation and green roofs and walls; then
    - Manage the heat within the building through exposed internal thermal mass and high ceilings; then
    - Passive ventilation; then
    - Mechanical ventilation; then
    - Active cooling systems (ensuring they are the lowest carbon options).

- P62 – Energy

1. Major development must reduce carbon emissions on site by:
   - 100% on 2013 Building Regulations Part L standards for residential development
   - A minimum of 40% on 2013 Buildings Regulations Part L up to 2019, and zero carbon (100%) from 1 January 2019 onward, for non-residential developments.
   - Any shortfall against carbon emissions reduction requirements must be secured off-site through planning obligations or a financial contribution.
2. Major development must be designed to incorporate decentralised energy in accordance with the following hierarchy:
   - Connect to an existing decentralised energy network; then
   - Be future-proofed to connect to a planned decentralised energy network; or
   - Implement a site-wide low carbon communal heating system; and
   - Explore and evaluate the potential to oversize the communal heating system for connection and supply to adjacent sites and, where feasible be implemented.

Industry Guidance

BSI (2011) EN 15978:2011 Sustainability of Construction Works. Assessment of Environmental Performance of Buildings.

Focuses on the calculation method to assess the environmental performance of a building, based on life cycle assessment (LCA) for both new and existing buildings. Providing a description of the object of assessment, system boundaries applicable at the building level, procedures used for inventory analysis, a list of indicators and procedures for calculation, reporting and data requirements.

IEMA (2017) Assessing Greenhouse Gas Emissions and Evaluating their Significance.
Best practice guidance in assessing GHG emissions and evaluating their significance in EIA projects

RICS (2017) Whole Life Carbon Assessment for the built environment (1st edition).
This guidance note provides a framework of practical guidance for quantity surveyors on how to calculate embodied carbon emissions associated with their projects.

RICS (2014) Methodology to Calculate Embodied Carbon.
Methodology to calculate the total carbon emitted for a building, known as embodied carbon, across the entire property lifecycle from construction through to demolition.

UKGBC (2017) Embodied Carbon: Developing a Client Brief.
This guide is designed for those who need to write effective briefs for commissioning their first embodied carbon measurements, but who may be at an early stage of embodied carbon knowledge.

WRAP (2011) Cutting Embodied Carbon in Construction Projects.
A guidance document produced by WRAP for construction clients and designers to help identify basic, cost-effective actions to reduce the carbon impact of the materials used in construction project.

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