

TM54 Energy Assessment

138-144 Friar Street

For National Pub Portfolio Limited

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1 Executive Summary

Energy Assessments have been carried out for the proposed development at 138-144 Friar Street in Reading, using Part L 2021 and CIBSE TM54 (2022) methodologies.

1.1 Part L assessment

Part L is commonly used to show compliance with policies and regulations. The proposed development was found to achieve an Energy Use Intensity (EUI) of 83 kWh/m².year using this methodology. The Space Heating Demand (SHD) was estimated to be 20.8 kWh/m².year.

The annual regulated carbon emissions were found to be 43.6 tonnes of CO₂ (tCO₂) while the unregulated carbon emissions 10.2 tCO₂. Therefore, the total annual emissions would be in the region of 53.8 tCO₂ using Part L calculation methods.

1.2 TM54 assessment

Building Regulations modelling does not capture energy use patterns that can arise from varying occupancy, weather files, and building user behaviours as well as does not consider additional unregulated energy uses such as external lighting, lifts, etc. It is a more simplified method of calculation to show a comparison between a proposed building design against a set of specifications of a Notional Building which has an almost identical design to the proposed building (with few exceptions such as the amount of glazing).

The latest guidance by RICS (Whole Life Carbon Assessment (WLCA) for the built environment, 2023), advises against the use of carbon emissions estimations from Part L methodology. The emerging Draft Partial Update (2025) to Reading Borough Council's (RBC) Local Plan reflects this.

CIBSE TM54 Energy Assessments use dynamic thermal simulations and scenario analysis to estimate the predicted Energy Use Intensity (EUI) of buildings.

The proposed development's predicted energy use (including regulated and unregulated energy) is anticipated to be in the region of 74-90 kWh/m².year for the low and mid-range scenarios

that assume good quality construction, efficient fabric and services design, appropriate commissioning and maintenance of building services, as well as reasonable use of the spaces by future occupants.

Where deviations from these key modelling assumptions occur during the lifetime of the development, the predicted EUI could rise in certain, more extreme circumstances represented by the high-end and worst-case scenarios, and could reach circa 120-160 kWh/m².year. It should be appreciated that these represent more extreme scenarios, combining inadequate maintenance, poor system performance, and use of spaces in ways which reasonable future users would typically avoid (e.g. 24/7 heating all year, strict heating and cooling setpoints). Further details on these modelling scenarios are presented in the main body of the report.

The SHD was estimated to range from 7-12 kWh/m².year for the low and mid-range scenarios. This estimate would rise for the high-end and worst-case scenarios but mostly due to reasons which are outside the developer's control.

For the first year of occupancy, the operational carbon emissions are estimated to range between 40-110 tCO₂ per annum. The comparison between the different analyses is shown in Figure 1.

Lifetime carbon emissions over a 60-year timeframe were evaluated under three different carbon factor scenarios in line with RICS 2023 guidance for module B6, for electricity use. For the mid-range energy prediction assessment, carbon emissions were estimated to be just under 800 kgCO₂e/m² for a non-decarbonised grid scenario, circa 110 kgCO₂e/m² for a decarbonised grid scenario, and circa 250 kgCO₂e/m² for a carbon factor scenario which is a hybrid of the previous two as set out within RICS 2023 guidance. The 60-year lifetime carbon estimates are shown in Figure 2. Aside from electrical energy, a minor, occasional use of the emergency back-up diesel generator for testing and maintenance was also evaluated and an estimate of 2-4 tCO₂e per year was calculated (24-48 kgCO₂e/m² over 60 years).

Overall, the proposed development is anticipated to perform in line with RBC's emerging draft policy CC2 in terms of EUI and SHD for the mid-range scenario.

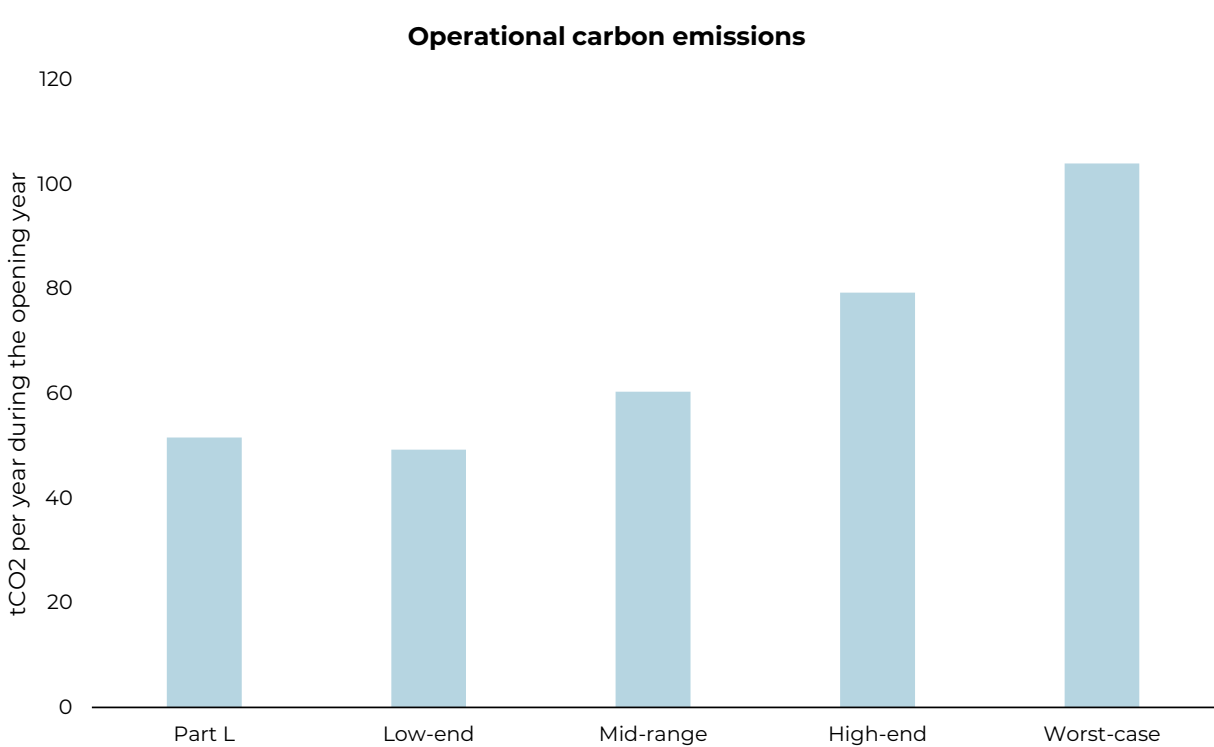


Figure 1. Predicted first year operational carbon emissions (regulated and unregulated) using different calculation methods.

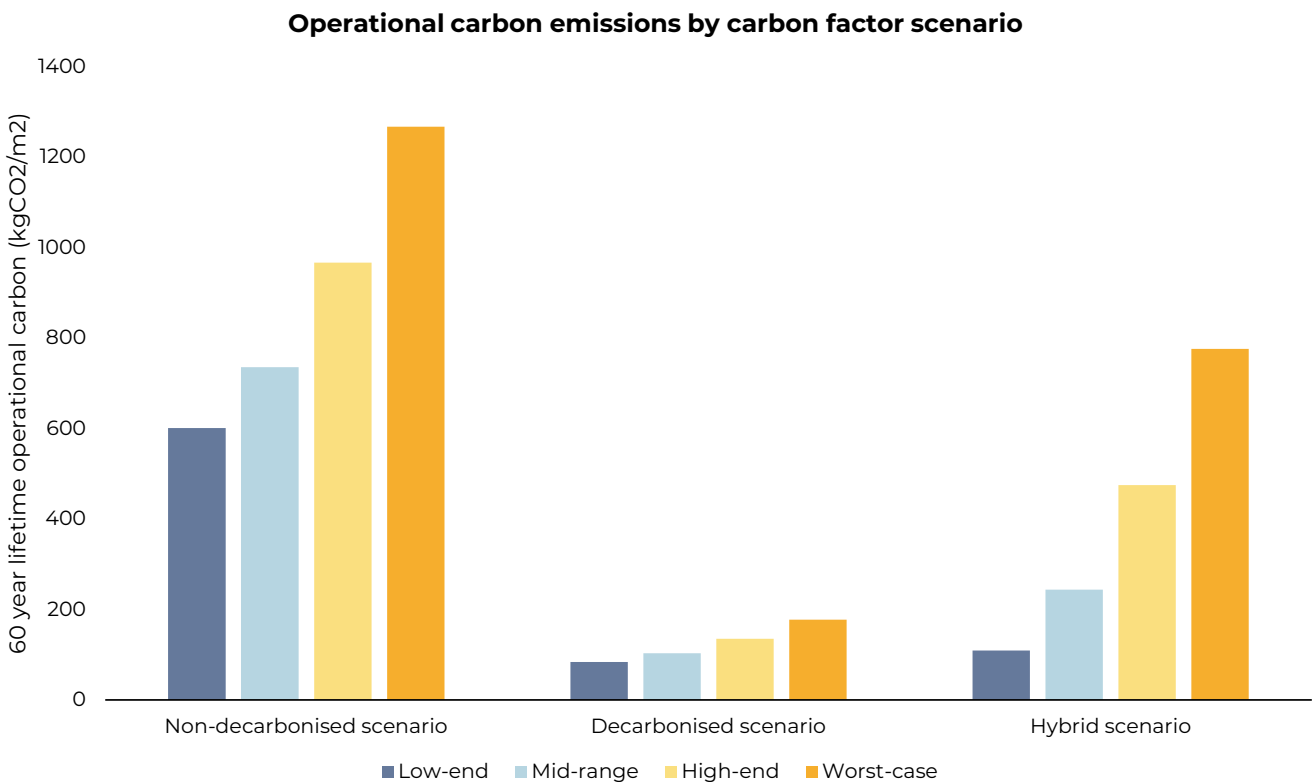


Figure 2. Lifetime carbon emissions using varying energy performance and carbon factor scenarios.

2 Introduction

2.1 Site

The site is situated in the heart of Reading Town Centre, adjacent to the key junction of Friar Street and Queen Victoria Street (QVS), approximately a 3-minute walk (circa 250m) from Reading Railway Station.

The site is located adjacent to Queen Victoria Street – Phase 1 (QVS1), which has consent for hotel and leisure use and is currently under refurbishment. These proposals relate to Queen Victoria Street – Phase 2 and are linked to the expansion of the QVS1 application, aiming to further the shared vision of Reading Borough Council and local stakeholders.

A previous application for hotel use on this site was approved (planning ref: PL/22/1235); however, following review the hotel proposal was not considered viable.

The current application is for the phased redevelopment of the site involving the demolition of Nos. 138–141 and 142–143 Friar Street, partial demolition of No. 144 Friar Street, and erection of a basement and 6-storey building to provide co-living residential accommodation (purpose-built shared living accommodation – Sui Generis use class), together with the partial retention of the former Bugle Public House as a standalone Class E commercial unit.

The indicative site location is shown in Figure 3.

2.2 Report aims

This report aims to calculate the predicted annual energy use of the proposed development using different calculation methods currently available in the industry.

It presents the findings of the Part L calculation method which is used for compliance purposes purely as a reference, and subsequently details the assumptions and modelling inputs used to carry out scenario analysis using CIBSE TM54 methodology to derive the potential predicted annual energy use.

It should be readily appreciated that predicting the energy use of a building is dependent on

various climatic and operational factors, and it is not possible to derive a single specific figure of EUI. However, the methodology enables design teams and client to review factors that can influence potential energy use, and fine-tune the building's performance in operation.

As this assessment is carried out at pre-planning stage, it invariably includes some assumptions which can only be refined during subsequent detailed design and construction stages. It is recommended that the TM54 assessment is updated at subsequent project stages to evaluate the estimated EUI and align the reporting more closely with potential BREEAM v7 criteria if and where required.

2.3 Scope of assessment

As discussed within the Energy and Sustainability Statement, the energy assessment focuses on the main co-living proposal for the application site.

The Bugle public house which is proposed to be retained is very minor in scale (circa 116m²) and forms only circa 2% of the total GIA of the scheme. The scope of works to The Bugle is very limited, comprising the repair of façade and timber details, retile of roof, replacement of rainwater goods. The pub will also have its own separate access, is retained rather than new build, and is anticipated to be delivered shell only rather than fully fitted as the co-living scheme.

The main potential environmental effects from the scheme will be from the co-living development which is covered under the energy assessment.

Where required, Building Regulations Part L requirements for existing buildings will be met as part of the retention and refurbishment works for The Bugle.



Figure 3. Indicative site location of 138-144 Friar Street (source: Google Maps, accessed: June 2026).

3 Part L Assessment

The proposed development is expected to achieve a 18% reduction in regulated CO₂ at Step 1 of the energy hierarchy and an overall reduction of 27% over the Part L2 2021 baseline.

The detailed results are shown in the following tables and Figure 4.

The EUI predicted with Part L modelling methodology was found to be 83 kWh/m².year.

For further details, please refer to the accompanying Energy and Sustainability Statement prepared for the planning application.

Table 1. Carbon emissions after each stage of the Energy Hierarchy for 138-144 Friar Street.

	Carbon Dioxide Emissions (tCO ₂ /yr)	
	Regulated	Unregulated
Baseline: Part L 2021 compliant development	59.5	10.2
After energy demand reduction (Step 1)	48.6	10.2
After heat network connection (Step 2)	48.6	10.2
After renewable energy (Step 3)	43.6	10.2

Table 2. Regulated carbon savings from each stage of the Energy Hierarchy for 138-144 Friar Street.

	Regulated carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Step 1: Savings from energy demand reduction	10.8	18%
Step 2: Savings from heat network	0.0	0%
Step 3: Savings from renewable energy	5.1	9%
Cumulative on site savings	15.9	27%

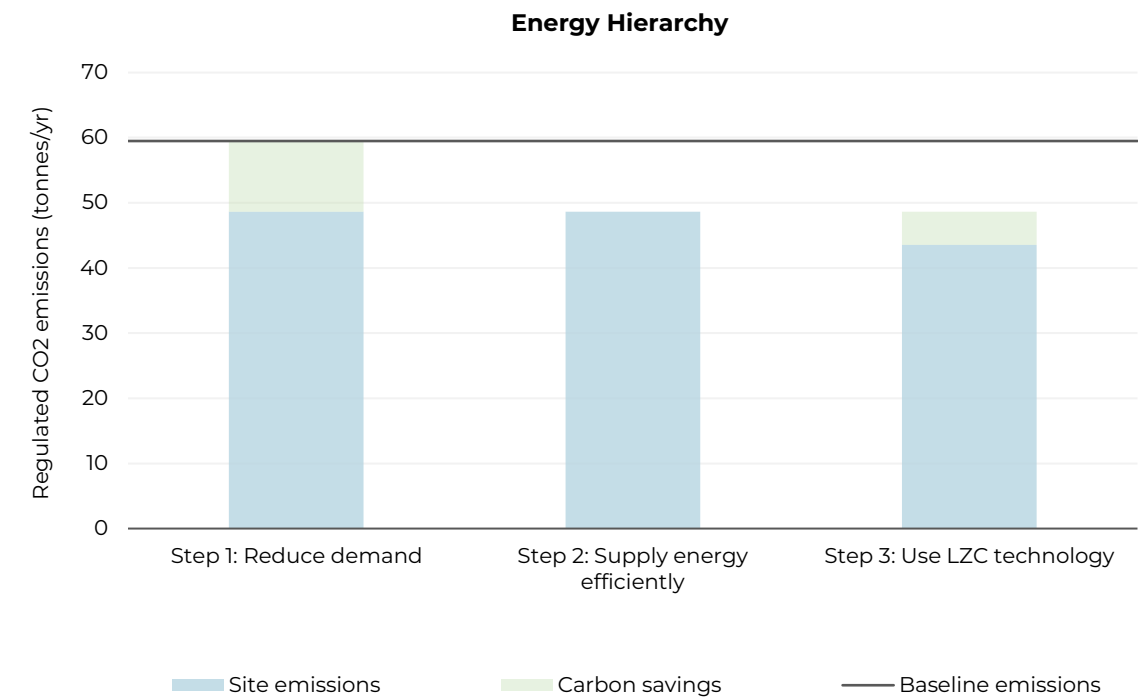


Figure 4. Regulated carbon emissions at each stage of the Energy Hierarchy for the development.

4 TM54 Assessment

This section of the report presents the planning stage analyses carried out to predict the operational energy and carbon emissions of the proposed development, using dynamic simulations and scenarios as opposed to the more standardised approach of Building Regulations Part L.

4.1 Choice of modelling tool

The proposed development has been modelled using dynamic thermal simulation software which is fully compliant with CIBSE Applications Manual AM11. The software can compute operative temperatures using CIBSE weather data sets, building fabric specification, window areas and opening, all aspects of solar and internal gains as well as natural ventilation flows within buildings.

The dynamic simulation modelling (DSM) tool IES Virtual Environment was used to estimate the operational energy consumption of the development under expected conditions, using an hourly resolution over a year.

DSM tools provide a holistic estimate of energy use as they consider the variation of energy consumption over time by simulating the dynamic relationship between the building form, fabric, external weather, occupants and usage patterns. The heating, ventilation and cooling (HVAC) plant can also be developed either as part of an existing dynamic simulation template (template HVAC Modelling) or through separate HVAC modules specified at a component level (detailed HVAC Modelling).

Since the proposed development is predominantly a residential institution with less inherent complexity in HVAC designs than commercial buildings, an operational energy model has been set up using the template HVAC modelling approach. This approach is better suited for early-stage calculations at planning stage and before detailed M&E services designs are developed for the scheme post-planning. Variations in the systems performance have been accounted for under a range of scenarios to evaluate impacts on predicted operational energy and carbon emissions.

Dynamic simulation models require a range of different input parameters to be able to provide detailed outputs and accurate insights into building performance. Further information about the input data can be found in following sections.

A thermal model was initially set up based on information available for the proposed development together with data obtained from sources such as CIBSE and the National Calculation Methodology (NCM). Through scenario analysis, variations to this input data were explored to evaluate the extent of impact they can have on predicted energy use and operational emissions, considering guidance from CIBSE TM54 and LETI's Operational Modelling Guide.

4.2 Weather file

London Test Reference Year weather data was used for the external ambient conditions the development may experience. This is a statistical representation of past weather and can be used as a starting point of the analysis. The overall energy use can be highly dependent on external conditions. The impact of the weather is included in the sensitivity analysis.

CIBSE have also developed Design Summer Year (DSY) weather files which are typically used for overheating risk assessments. These files are climate-change adjusted versions of the current DSY and are split into three categories:

- DSY1 which represents a moderately warm summer.
- DSY2 includes a more intense single warm spell.
- DSY3 includes a more prolonged period of consistent warmth.

Following the methodology set out in CIBSE TM49, these weather files are further subdivided into different emissions scenarios and different periods. DSY1 2050's high emissions, 50% percentile (for the 50% percentile changes which may be viewed as the 'best guess' level of change) weather file was introduced as a scenario to the analysis, to evaluate impacts on operational energy and emissions of the proposed development under a future weather profile.



4.3 Modelling data

4.3.1 Thermal model geometry

The building geometry and the context of the proposed development was modelled within IES using planning stage drawings issued by Falconer Chester Hall Architects. The 3D model geometry is shown in Figure 5.

4.3.2 Building fabric

The building fabric considered in the assessment is shown in Table 3, and has been informed by early-stage discussions with the design team and client.

Given the fabric is of relatively high specification and that glazing areas are reasonable (circa 30% of exposed wall area), changes to the building fabric are not explored via the TM54 assessment.

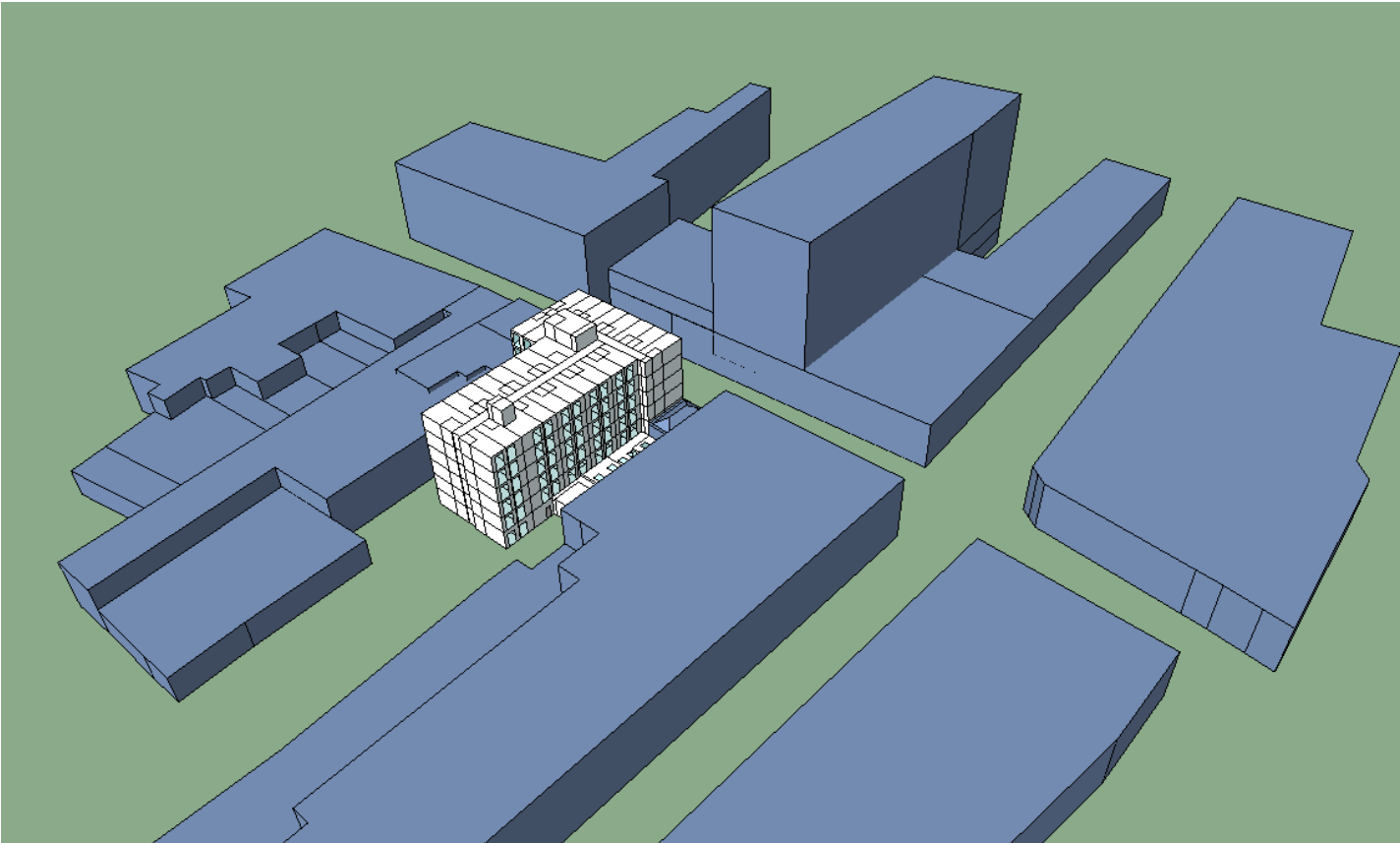


Figure 5. 3D technical model of the proposed development.

Table 3: Thermal model building fabric.

Element	Specification
External wall U-value	0.15 W / m².K
Floor U-value	0.10 W / m².K
Roof U-value	0.11 W / m².K
Glazing U-value	1.2 W / m².K
Glazing g-value	0.4
Air permeability	3m³ / m².h at 50 Pa

4.3.3 Occupancy and gains profiles

CIBSE does not specify the exact hours that the spaces are occupied, and as a result the Building Research Establishment’s (BRE) estimates that are inherited for the National Calculation Methodology (NCM) are used as a basis for the prediction of the occupied hours of different areas of a building (Table 4). The exact occupation patterns are not possible to predict precisely, therefore the NCM data provide a reasonable starting point. However, for the co-living studio spaces, occupation is initially assumed to be on a 24/7 basis as opposed to 10pm-9am from the NCM profiles.

The occupancy is applied throughout the year for all areas of the development and an element of variation in occupancy would be explored through the scenario analysis.

Table 5 shows the input parameters for internal heat gains. These gains can also vary during the lifetime of the development as they depend on occupant habits and preferences. Variations in lighting densities have been considered in the scenario analysis to evaluate the effect this would have on predicted operational energy and carbon emissions.

Table 4. Predicted occupation patterns for key areas.

Area	Predicted occupation pattern
Studio / co-living units	24/7 daily (worst-case)
Studio bathrooms	7am-10am and 7pm to 11pm (every day)
Communal corridors	7am-11pm (constant)
Gym	9am-9pm (constant)
Dining / café	7am-11pm (variable peaking around lunch and dinner times)
Co-working / Lounge	7am-7pm (variable, with peak occupancy 9am-1pm and 2pm-5pm)
Multimedia room	9am to 9pm with variation throughout the day

Table 5. Internal heat gains densities.

Area	Lighting (W/m²)	Equipment (W/m²)	People heat gain (W)	Occupant density
Studio / co-living units	5.2 W/m²	4 W/m²	61W / person sensible 39W / person latent	20 m² / person
Studio bathrooms	5.2 W/m²	2 W/m²	60W / person sensible 60W / person latent	3.8 m² / person
Communal corridors	5.2 W/m²	2 W/m²	70W / person sensible 70W / person latent	9 m² / person
Gym	15.6 W/m²	16 W/m²	102W / person sensible 198W / person latent	7 m² / person
Dining / Cafe	15.2 W/m²	15 W/m²	67W / person sensible 43W / person latent	5 m² / person
Co-working/ Lounge	12 W/m²	13 W/m²	73W / person sensible 50W / person latent	9 m² / person
Multimedia room	12 W/m²	2 W/m²	85W / person sensible 55W / person latent	5.5 m² / person

4.3.4 HVAC systems

The systems considered in the assessment are based on the proposed Energy Strategy for the scheme at planning stage (for details please refer to the accompanying Energy and Sustainability Statement for the planning application). This is outlined in Table 6.

Table 7 summarises the system inputs with initial information on variations modelled to assess the impact of occupant and building user behaviour on energy performance and associated carbon emissions.

Due to noise constraints, it was determined that co-living studios of the proposed development would require a form of back-up system to provide an element of trim cooling. The Overheating Risk Assessment identified that co-living units/ studios are likely to utilise air tempering coils attached to the MVHR systems. These coils have a cooling capacity of circa 1-2kW dependent on environmental conditions, system design and specification. The potential variability in performance of this system was explored in more detail, as discussed in section 4.4 (Scenario methodology) of the report.

4.3.5 Hot water demand

The hot water demand for the development has been estimated using guidance from CIBSE TM54 (Table 8).

Table 6. HVAC systems for the different areas of the scheme.

Area	Heating & hot water	Cooling	Mechanical ventilation
Studios / co-living units	Centralised Air Source Heat Pump (ASHP)	n/a	Mechanical Ventilation with Heat Recovery (MVHR)
Gym	ASHP	ASHP	MVHR
Dining/ Café	ASHP	ASHP	MVHR
Co-working / Lounge	ASHP	ASHP	MVHR
Multimedia room	ASHP	ASHP	MVHR

Table 7. Initial system modelling inputs.

Area	Heating setpoint	Cooling setpoint	Mechanical ventilation	Natural ventilation
Studios / co-living units	19-22°C	Variable from MVHR air tempering coil. 23-25°C / 1-2kW	13 – 60 l/s (see Table 12)	A range of opening areas, see Table 12
Gym	18°C	22-25°C	30 l/s.p	n/a
Dining/ Café	20°C	22-25°C	10 l/s.p	n/a
Co-working / Lounge	20°C	22-25°C	10 l/s.p	n/a
Multimedia room	20°C	22-25°C	10 l/s.p	n/a

Table 8. Hot water modelling inputs.

Area	Daily hot water demand	Storage per 24hr
Studios / co-living units	115 litres / person (CIBSE TM54 assumptions, separate to Part G targets)	32 litres
Basement and ground floor shared spaces	14 litres / person	4.5 litres

4.3.6 Other end-uses

Considerations were made for additional services equipment which are not typically assessed under the Part L 2021 Building Regulations methodology. These are detailed in Table 9.

Table 10 details information and initial modelling inputs for pumping energy calculations. The energy estimated from pumps is included in the fans and pumps section of the results. Fire pumps are considered an emergency asset with 0% diversity and were not included in the analysis, although a small parasitic load would be present on site. The dynamic thermal modelling software includes default Auxiliary Energy Value (AEV) for different system types. Pumping energy estimations were derived both from simulations and spreadsheet-based calculations to evaluate a potential range of outcomes. These assessments are early stage and should be refined as the design progresses post-planning to construction stage.

The performance of fans considered the Specific Fan Power (SFP) provided by M&E consultants for the various spaces, together with anticipated flow rates. Fan energy was assessed as part of the scenario analyses to evaluate different SFP as well as account for the potentially elevated flow rates during summer within the co-living units to dissipate heat gains.

The proposed development would also include an emergency backup diesel generator. It is assumed this would be utilised for life safety only, including operation of fire lifts, fire pump set, smoke extract fans, and emergency lighting. Assumptions for potential annual consumption is shown in Table 11.

Table 9. Consideration of other energy using items within the development.

Item	Power rating (kW)	Notes and operation assumptions
Refuse extract	2no fans 0.4 kW each.	Constant operation with 70% diversity applied.
Lifts	2no. lifts 7 kW each assumed.	Energy calculation based on CIBSE TM54 guidance.
External lighting	2 W/m² of lighting for the site's area.	Site lighting 8 hours per day on average.

Table 10. Alternative method of assessing pumping energy within the development.

Item	Power rating (kW)	Notes and operation assumptions
Cold water pumps	3no pumps 2.5 kW each.	40% diversity applied and 6,000 hours of operation per year assumed.
Heating	2no. primary shunt pumps 3 kW each and 2no. secondary LTHW pumps 3 kW each.	1 duty / 1 standby for each assembly. 50% diversity applied to both assemblies. 3,500 hours of operation per year assumed.
Hot water	2no. 1 kW pumps.	1 duty / 1 standby. 50% diversity applied and 24/7/365 operation.
Drainage sump pumps	2no 2.2 kW each.	1 duty / 1 standby. 50% diversity, 200 hours per year.
Condensate pumps for basement/ ground floor VRF systems	6no. 50 W each.	60% diversity, 1,500 hours per year assumed.

Table 11. Backup generator for life safety systems and associated assumptions at early stage.

Capacity	Fuel burn	Runtime
120 kVA	18 litres / hour at 75% load.	18-36 hours per year.

4.4 Scenario methodology

For the proposed development, the area of studios/co-living units is much more significant than the basement and ground floor shared areas and the majority of the expected energy use is likely to be driven by consumption from the co-living units. Nevertheless, the scenarios included variations to all portions of the scheme.

The variables presented in Table 12 and Table 13 were deemed the most crucial in determining the potential energy consumption and associated operational emissions.

It is appreciated that the building fabric’s U-values and air permeability are dynamic in nature in reality. However, given there is less degradation in the quality of the building fabric over time compared to building services and the project is at an early-stage pre-planning, the variation of fabric specifications were not factored into the scenario analysis. Sensitivity analysis for the fabric can be carried out post-planning, once the breadth of variables factored into the modelling is narrowed down slightly with detailed design of building services together with a better understanding of the likely selection of products and systems in the scheme.

System performance, occupancy/ operational variations and climate were interrogated the most through the scenario analysis at this stage as they could have the most significant impact on outcomes.

The principles of the scenarios explored can be summarised as follows:

- Low-end: assumes all systems are maintained regularly and are operating efficiently in line with current regulations and manufacturer declarations. Low impact from occupant behaviour or controls, less strict setpoints and an overall diversity to account for a proportion of the development being unoccupied at any given time.
- Mid-range: Slightly less favourable scenario compared to low-end across all parameters. Deviates in terms of efficiencies from manufacturer declarations, introduces the use of window openings for the co-living units to mimic potential occupant behaviour for purging in the morning and evening during cooking hours in winter; windows fully open between May-September in line with Overheating mitigation strategy during daytime, while air tempering coils are utilised during night-time between May-September when windows may be closed due to noise constraints.
- High-end: Approximates the effect of less regularly maintained systems, installation of additional lighting by building users, and stricter environmental controls (higher heating setpoint, higher cooling coil capacity for co-living units and lower cooling set points).
- Worst-case: Least favourable assumptions across the board, assuming little to no system maintenance over their typical 20-year lifespan, strictest internal environmental conditions (higher heating setpoint, higher cooling coil capacity for co-living units and lower cooling set point for communal spaces), no occupancy diversity across the year. DSY1 weather file for the 2050's period is used for this scenario.

Table 12. Co-living units modelling scenarios.

Co-living areas	Low-end	Mid-range	High end	Worst-case
Heating SCOP	3.5	3.0	2.6	2.2
Heating setpoint	19°C 7am-9am,12-2pm, 7-9pm daily, Oct-Apr	20°C 7am-9am,12-2pm, 7-9pm daily, Oct-Apr	21°C 7am-9pm daily, Oct-Apr	22°C 24/7/365
Hot water SCOP	3.0	2.6	2.3	2.0
Waste water heat recovery	Yes	No	No	No
Average MVHR flow rate (l/s)	13 (Oct-Apr) 25 (May-Sep)	15 (Oct-Apr) 30 (May-Sep)	15 (Oct-Apr) 40 (May-Sep)	20 (Oct-Apr) 60 (May-Sep)
Specific Fan Power (W/litre/sec)	0.6	0.8	1.0	1.2
Cooling coil capacity and setpoint	1 kW / 25°C 11pm-8am May-Sep	1.5 kW / 25°C 11pm-8am May-Sep	1.8 kW / 23°C 24/7 May-Sep	2 kW / 23°C 24/7/365
Lighting density	4 W/m²	5 W/m²	6 W/m²	7 W/m²
Window opening	None	2% average free area (2 hrs/day, Oct-Apr), 80% free area 9am-11pm May-Sep	10% average free area (2 hrs/day, all year)	15% average free area (2 hrs/day, all year)
Occupancy diversity	70%	80%	90%	100%
Weather file	TRY	TRY	TRY	DSY3 2050's

Table 13. Basement and ground floor communal spaces modelling scenarios.

Ground floor shared spaces	Low-end	Mid-range	High end	Worst-case
Heating SCOP	3.5	3	2.6	2.0
Cooling SEER	6	5	4	3
Specific Fan Power (W/litre/sec)	1.8	2.0	2.2	2.4
Cooling setpoint	25	24	23	23
Occupancy diversity	70%	80%	90%	100%
Weather file	TRY	TRY	TRY	DSY1 2050's

4.5 Results

4.5.1 Energy

Table 14 shows the predicted EUI and SHD for the different scenarios.

Potential EUI limits that could be used for the proposed development are shown in Table 15.

The predicted SHD is within RBC’s recommended benchmark in emerging draft policy CC2 which stipulates new developments should target SHD of 15-20 kWh/m².year, for the low-end and mid-range scenarios. These two scenarios better reflect the anticipated performance of the building. SHD for the high-end and worst-case scenarios may be above the recommended limit, but this is driven by factors beyond the developer’s control (e.g. poor maintenance of systems, occupant behaviour, etc).

The same conclusion can be drawn for EUI, which is predicated to range between 74-90 kWh/m².year, broadly in line with emerging draft policy CC2’s expectation for major developments to achieve 70-90 kWh/m².year.

Figure 6 presents the results of the analysis by end-use. This reflects the rationale of the scenarios and most variation in performance is expected in end-uses which are influenced by system performance over time, occupancy factors and building user habits. These end-uses include heating, cooling, hot water and lighting. Plug loads and other equipment may also vary depending on operational considerations although the extent of variation is currently expected to be lower.

Aside from electricity use, it has been estimated that circa 900 litres of diesel (or 9,100 kWh of thermal energy, with approximately 3,600 kWh of electricity generated) may be used annually by the back-up diesel generators, which equates to an annual carbon footprint of circa 2-4 tCO₂e/ year.

Table 14. Planning stage predicted annual energy use (electricity).

Building use	Low-end	Mid-range	High-end	Worst-case
SHD (kWh/m². year)	7	12	31	48
Total Energy (MWh / year)	363	444	583	765
EUI (kWh/m².year)	74	90	118	155

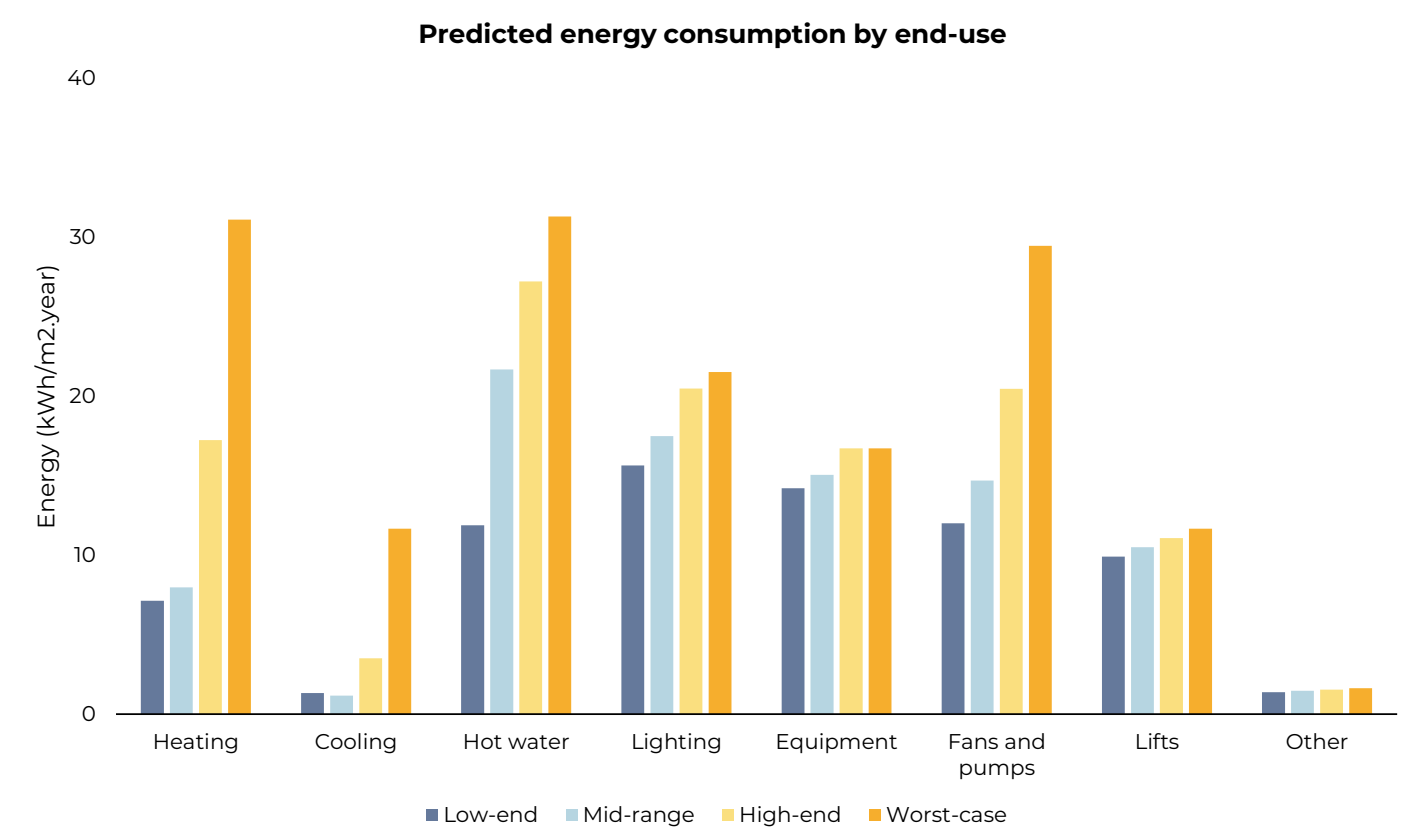


Figure 6. Predicted energy consumption by end-use (electricity).

Table 15. EUI benchmarks/limits presented by different industry sources.

Energy Use Intensity	Source
49 kWh/m².year	UK NZCBS for flats (year 2028)
116 kWh/m².year	UK NZCBS for hotels (year 2028)
70 kWh/m².year	UK NZCBS for commercial residential such as student accommodation (year 2028). This limit was used to inform the carbon emissions calculation for the hybrid scenario (section 0).
140 kWh/m².year	UK NZCBS for commercial residential such as Care Homes (year 2028)
35 kWh/m².year	LETI (for residential buildings)
75-90 kWh/m².year	RBC’s emerging Draft Partial Update of the Local Plan (2025), draft policy CC2.

4.5.2 Carbon emissions

In order to calculate the operational carbon emissions of the proposed development, the guidance by RICS 2023 was adopted.

The carbon emissions assessments carried out include the following scenarios:

- 1. Non-decarbonised grid: predicted energy used is multiplied with the current carbon factor of the electricity grid. The current Part L 2021 carbon factor of 0.136 kgCO₂e/kWh for grid electricity is used over a 60-year time frame.
- 2. Decarbonised grid: the carbon factor reduces over time, and data is taken from Future Energy Scenarios (FES) developed by National Grid. The falling short scenario is used. From 2050 onwards, the carbon factor estimated for 2050 is used to calculate emissions of the Proposed development beyond 2050. The average carbon factor for grid electricity across the 60-year period from 2028 (assumed first year of occupation) to 2088 was estimated to be circa 0.019 kgCO₂e/kWh.
- 3. Net-zero-grid-compatible (hybrid): this can only be applied for full electric schemes such as the proposed development and is a hybrid carbon scenario of the previous two. Energy above a suitable EUI limit (70 kWh/m².yr, in line with row 3 of Table 15) is converted to carbon emissions without decarbonisation, while energy within the recommended EUI limit is decarbonised. The average decarbonised factor over the 60-lifetime is used for energy use up to this energy limit (estimated at circa 0.019 kgCO₂e/kWh), and a non-decarbonised factor is used for all energy use beyond the recommended energy limit (0.136 kgCO₂e/kWh).

Further information is provided in the accompanying Whole Life Carbon (WLC) Assessment for the planning application. It should be noted that the WLC Assessment was carried out in specialist software eToolLCD, and has used operational energy estimates of this TM54 assessment, specifically from the low-end and mid-range scenarios, as these are currently

considered the most representative predictions for the scheme based on the initial design at RIBA Stage 2. It is recommended that as the design progresses that both the TM54 and WLC assessments are updated to reflect the latest design and specifications.

As it would be readily appreciated, predicting energy consumption and carbon emissions over a 60-year period cannot be exact, but the assessment has aimed to show the potential outcomes based on a variety of scenarios as recommended by latest industry guidance and practice.

The operational carbon emissions could range between 100-800 kgCO₂e/m² for the low and mid-range energy modelling scenarios dependent on the carbon factors used over the 60-year study period.

The results are shown in Figure 7.

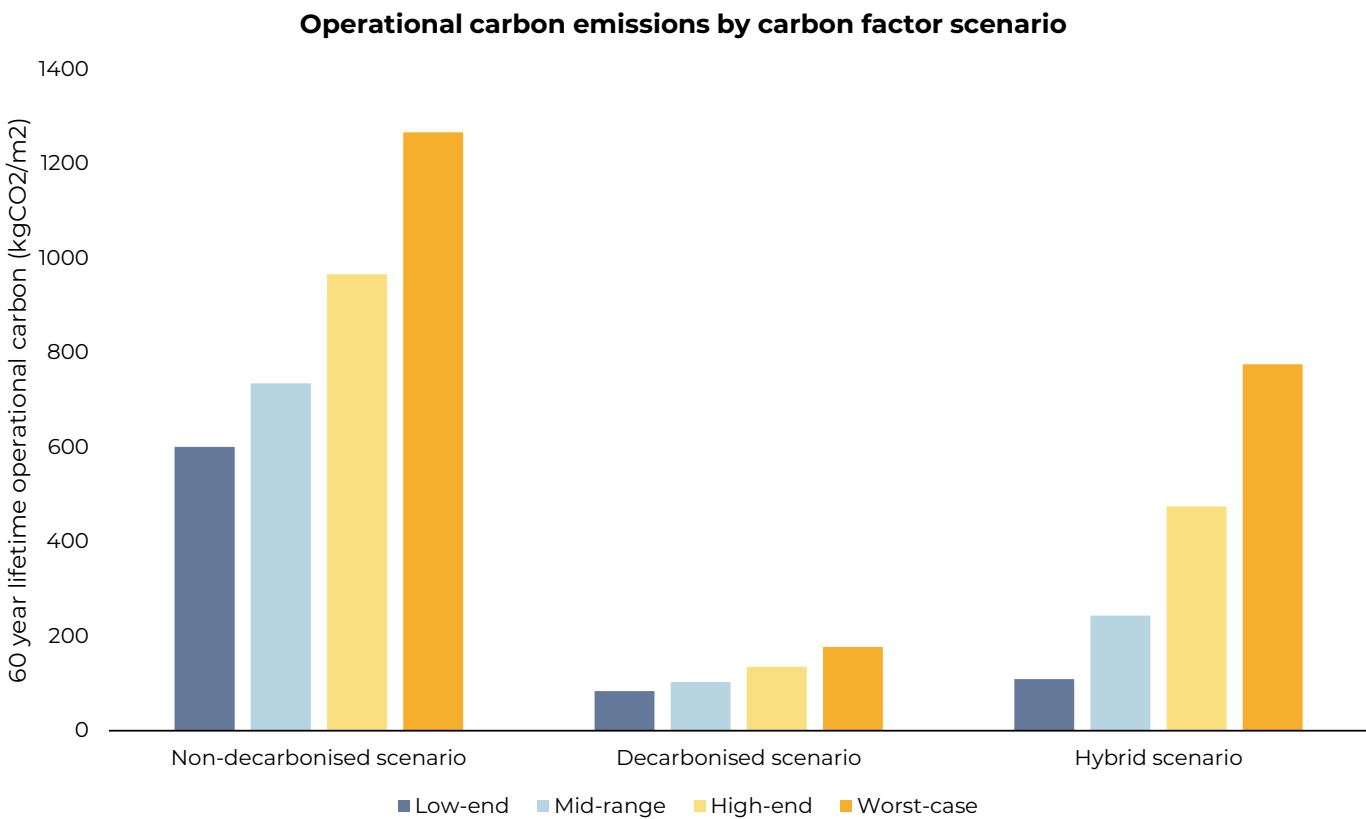


Figure 7. Predicted variation of operational carbon emissions over a 60-year study period for all energy assessment scenarios (low-end, midrange, high end, worst-case) with the different carbon factor scenarios over this timeframe.

5 Conclusions

Energy Assessments have been carried out for 138-144 Friar Street using both building regulations and predictive calculation methods.

Part L 2021, RICS PS (2023) and CIBSE TM54 (2022) conventions and guidance were used to inform these analyses.

The Part L assessment confirms that the proposed development performs favourably against the regulatory baseline and benefits from a fabric-first approach, efficient building services and renewable energy provision.

The TM54 assessment provides a more representative prediction of operational energy use by considering building operation, occupancy, weather sensitivity, system performance and unregulated energy uses that are not fully captured by the Part L methodology. The low-end and mid-range scenarios indicate that the development has the potential to operate within a comparatively efficient range where the design intent is maintained through good quality construction, commissioning, maintenance and reasonable occupant behaviour.

The higher-energy scenarios demonstrate that operational performance could be materially affected where less favourable assumptions occur in combination. The main sensitivities relate to system performance, selected heating and cooling setpoints, lighting densities, occupancy diversity and future weather conditions. These scenarios should be interpreted as worse case sensitivity tests rather than typical operating conditions.

The operational carbon assessment shows that emissions are strongly influenced by both the level of operational energy demand and the carbon factor scenario applied over the study period. This highlights the importance of reducing energy demand in operation, while recognising the role of future grid decarbonisation in determining long-term carbon outcomes.

To reduce the risk of performance drift, the design should continue to prioritise efficient services

operation and maintenance, robust controls and metering, appropriate energy demand management and clear building user guidance, among other considerations.

As the assessment has been undertaken at planning stage, the modelling assumptions should be reviewed and refined as the design develops. It is recommended that the TM54 assessment is updated at subsequent design stages once the building services strategy, controls philosophy, plant selections, metering arrangements and operational assumptions are further developed.

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