Project Address	Unit 1, 144/144a Whitehall Road, Bristol, BS5 9BP.
Project Reference	#75820
Building Regulations	Part L (2021)
Assessment Type	Conversion/Energy Statement

Date: 07/02/2025 – Version 1.0

Contents

Executive Summary

The energy strategy for the **Unit 1, 144/144a Whitehall Road** development, has been developed in line with the energy policies of **Bristol Local Plan**. The three-step Energy Hierarchy has been implemented and the estimated regulated CO2 savings on site are **43%** for the development, against a Part L 2021 compliance scheme, with SAP10 carbon factors.

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at **144/144a Whitehall Road,** located in Bristol City Council.

In line with Bristol City Local Plan policy **BCS14**, the development would need to achieve a '**20% reduction**' target for regulated CO2 emissions against a Building Regulations (Part L 2021) compliant scheme and baseline.

The energy strategy outlined in this report has been developed using the SAP10 emissions factors to ensure the development meets the upcoming version of the Building Regulations.

The methodology used to determine the expected operational CO2 emissions for the development is in accordance with the Bristol Local Plan three-step Energy Hierarchy and the CO2 savings achieved for each step are outlined below:

BE LEAN – USE LESS ENERGY

The first step addresses reduction in energy demand, through the adoption of passive and active design measures.

The proposed energy efficiency measures include levels of insulation beyond Building Regulation requirements, low air tightness levels, efficient lighting as well as energy saving controls for space conditioning and lighting.

By means of energy efficiency measures alone, regulated CO2 emissions are shown to reduce by:

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-0.3	-57%

BE CLEAN – SUPPLY ENERGY EFFICIENTLY

A site-wide heat network has not been found to be feasible or viable for a development of this scale; individual high efficiency **ASHP** are instead proposed to provide heat to the development in order to meet the Co2 reduction requirements. Based on the strategy proposed, no savings are achieved at the Be Clean stage.

BE GREEN – USE RENEWABLE ENERGY

The renewable technologies feasibility study carried out for the development identified **air source heat pump** as the most suitable technology for the development. The incorporation of renewable technologies will reduce CO2 emissions by a further:

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-0.3	-57%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	100%
Cumulative on site savings	**0.3**	**43%**

CARBON OFF-SETTING

The proposed development complies with the Bristol Local Plan CO2 savings target of 20% overall.

ENERGY CALCULATION TABLE

Inline with section 4 of the Climate Change and Sustainability (Addendum June 2023), the energy table has been completed to detail the C02 reduction for the proposed dwellings.

No District Heat Connection	**Regulated Energy Demand (MWh/yr)**	**Regulated C02 emissions (tonnes/yr)**	**C02 saved (tonnes/yr)**	**% C02 reduction**
Baseline – Part L TER		0.6		
Proposed Scheme after energy efficiency measures	5.59	0.9	-0.3	-57%
Residual emissions Proposed Scheme after energy efficiency measures and CHP (if using)	5.59	0.9	0	0%
Proposed scheme after on-site renewables	3.56	0.3	0.6	100%
Total C02 reduction beyond Part L TER			0.3	**43%**

The proposed development complies with the Bristol Local Plan CO2 savings target of 20% overall.

Introduction

This energy strategy has been prepared on behalf of Duncan Blackmore, hereafter referred to as the Applicant, in support of a full planning application for the of Unit 1, 144/144a Whitehall Road, Bristol, BS5 9BP, hereafter referred to as the Development.

The energy strategy for the development, has been developed in line with the energy policies of the Bristol Local Plan.

Site & Proposal

The applicant is proposing a refurbishment and change of use to the current site located at 144/144a Whitehall Road, into a modern, suburban, residential premises.

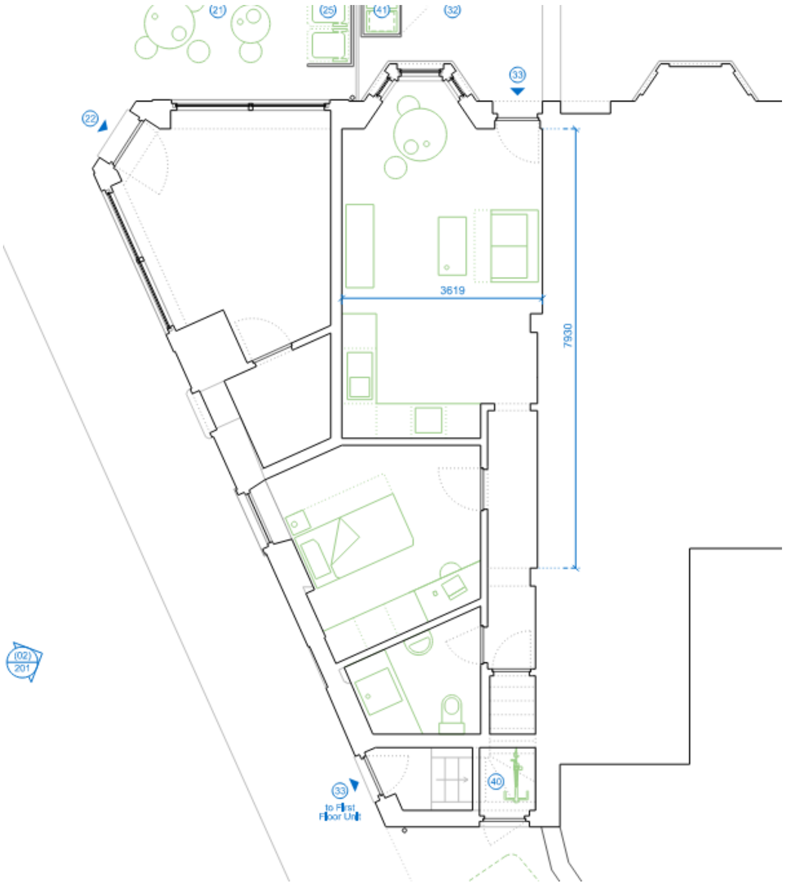

Image 1. Floor Plan

Image 2. Elevations

Policies & Requirements

The proposal will seek to respond to the energy policies of the Bristol Local Plan.

The most relevant applicable energy policies in the context of the proposed development are presented below.

THE BRISTOL LOCAL PLAN

Policy BCS14 requires a systematic approach whereby development reduces carbon emissions through the application of the following energy hierarchy:

1. Minimising energy requirements;

2. Incorporating renewable energy sources;

3. Incorporating low-carbon energy sources.

As such, the policy has four main strands:

• To encourage major freestanding renewable and low carbon energy installations;

• To reduce energy demand through the use of energy efficiency and conservation measures, including improvements in fabric efficiency and air permeability and use of passive design principles in new development;

• To secure at least a 20% saving in CO2 emissions from energy use in new development through on-site generation of renewable energy; and

• To ensure that heating and hot water systems are designed and specified in accordance with the heat hierarchy including, where appropriate, connection to a heat network.

Achieving high levels of energy performance beyond the requirements set by the Building Regulations should be viewed as a major priority in building design, particularly in light of the 'performance gap' between design and as-built energy performance that has been identified in recent years.

Renewable and low carbon energy generation, storage and distribution is a fast moving and dynamic area, in which innovative and emerging technologies are making good progress towards market entry and commercial viability. As such, the incorporation of innovative technologies and approaches is welcomed provided these are supported by robust evidence of their efficacy.

Methodology

The sections below present the methodology followed in determining the on-site and off-site carbon savings for the proposed scheme.

The methodology employed to develop the energy strategy for the scheme and achieve on-site carbon savings is in line with the Bristol Local Plan Guidance on preparing energy assessments and is as follows:

• **Be Lean** - Whereby the demand for energy is reduced through a range of passive and active energy efficiency measures; as part of this step the Cooling Hierarchy is implemented and measures are proposed to reduce the demand for active cooling;

• **Be Clean** - Whereby as much of the remaining energy demand is supplied as efficiently as possible (e.g. by connecting to a district energy network or developing a site-wide CHP network), and,

• **Be Green** - Whereby renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous step.

The implementation of the Energy Hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site.

Be Lean

The following proposals incorporate a range of passive and active design measures that will reduce the energy demand for space conditioning, hot water and lighting. The measures are as follows:

- **Enhanced U-values**

  The proposed development will incorporate high levels of insulation and high-performance glazing beyond Part L 2021 where possible. Careful consideration has been made in insulating to the best possible standard.

Element	U-Value (W/m2K)	
	Part L Limiting Factor	Development
Ground Floor	0.25	0.22
External Facade	0.30	0.28
Ceiling	0.16	0.15
Glazing	1.6	1.4
Doors	1.6	1.4

- **High Efficacy Lighting**

  The development intends to incorporate low energy lighting fittings throughout the development. All light fittings will be specified as low energy lighting, and will accommodate LED, compact fluorescent (CFLs) or fluorescent luminaires only.

Element	Part L Limiting Factor	Development
Low Energy Lighting	75%	100%

- **Air Tightness Improvement**

  An air permeability test has been proposed to further reduce on-site reductions. A realistic target of 7 has been set for the development.

Element	Part L Limiting Factor	Development
Air Permeability	8	7

<u>Overview of Be Lean Measures</u>

Element	U-Value (W/m2K)	
	Part L Limiting Factor	Development
Ground Floor	0.25	0.22
External Facade	0.30	0.28
Ceiling	0.16	0.15
Glazing	1.6	1.4
Doors	1.6	1.4

Element	Part L Limiting Factor	Development
Low Energy Lighting	75%	100%

Element	Part L Limiting Factor	Development
Air Permeability	8	7

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	37.66	68.49	-81.87%

Be Clean

The proposed development does not have a significant thermal demand and is not within an area of which allows for a decentralised energy network to be utilised, therefore this option will not be explored further within this energy statement. It is recommended that the site is development in a manner that will allow to connection to a district heating system in the future is one is to become feasible.

Be Green

The renewable technologies feasibility study carried out for the development identified an **air source heat pump** as suitable technology for the development. The regulated carbon saving achieved in this step of the Energy Hierarchy is **43%** over the site wide baseline level with SAP10 emission factors.

RENEWABLE TECHNOLOGIES FEASIBILITY STUDY

Methods of generating on-site renewable energy (Green) were assessed, once Lean and Clean measures were taken into account.

The development of 144/144a Whitehall Road will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance. A range of renewable technologies were subsequently considered including:

- Biomass;
- Ground/water source heat pumps;
- Air source heat pump;
- Wind energy;
- Photovoltaic panels
- Solar thermal panels.

In determining the appropriate renewable technology for the site, the following factors were considered:

- CO2 savings achieved;
- Site constraints;
- Any potential visual impacts.

Solar PV (Photovoltaic Panels)

A photovoltaic (PV) cell, commonly called a solar cell, is a nonmechanical device that converts sunlight directly into electricity. Some PV cells can convert artificial light into electricity.

A PV cell is made of semi-conductor material. When photons strike a PV cell, they may reflect off the cell, pass through the cell, or be absorbed by the semiconductor material. Only the absorbed photons provide energy to generate electricity. When the semiconductor material absorbs enough sunlight (solar energy), electrons are dislodged from the material's atoms.

The efficiency at which PV cells convert sunlight to electricity varies by the type of semiconductor material and PV cell technology. The efficiency of commercially available PV modules averaged less than 10% in the mid-1980s, increased to around 15% by 2015, and is now approaching 20% for state-of-the art modules. Experimental PV cells and PV cells for niche markets, such as space satellites, have achieved nearly 50% efficiency.

Photovoltaic (PV) Cells have been considered and have been deemed not viable for this site.

Ground Source Heat Pump

A ground source heat pump, sometimes referred to as a ground-to-water heat pump, transfers heat from the ground outside your home to heat your radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps and showers.

Thermal transfer fluid (TTF), a mixture of water and antifreeze (sometimes known as 'brine') flows around a loop of pipe, buried in your garden or outdoor space. This loop could either be a long or coiled pipe buried in trenches, or a long loop (called a 'probe') inserted into a borehole with a diameter of around 180mm.

Heat from the ground is absorbed into the fluid, which then passes through a heat exchanger into the heat pump. This raises the temperature of the fluid and then transfers that heat to water.

Ground Source Heat Pump has been considered for this project and has not been deemed viable due to the available external space. A more suitable technology has been selected to reduce the carbon emissions as well as financial and on-site feasibility.

Air Source Heat Pump

An air source heat pump is a low-carbon way of heating your home. They absorb latent heat from the outside air and use it to increase the temperature inside your home.

The air source heat pump absorbs heat from the outside air into a liquid refrigerant at a low temperature. Using electricity, the pump compresses the liquid to increase its temperature. It then condenses back into a liquid to release its stored heat. Heat is sent to your radiators or underfloor heating. The remainder can be stored in your hot water cylinder. The pump uses electricity to run, but it should use less electrical energy than the heat it produces. This makes them an energy-efficient way to warm your home.

Air Source Heat Pump has been considered and deemed a viable option for the project. The carbon reductions of the installation of a ASHP exceed the council requirements in carbon emissions and are a large contributing factor towards the total reduction of 48%.

Wind Energy

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines (known as 'microwind' or 'small-wind' turbines). A typical system in an exposed site could easily generate more power than a dwelling's lights and electrical appliances use.

Wind turbines use large blades to catch the wind. When the wind blows, the blades are forced round, driving a turbine which generates electricity. The stronger the wind, the more electricity produced. There are two types of domestic-sized wind turbine:

Pole mounted: these are free standing and are erected in a suitably exposed position, often around 5kW to 6Kw

Building mounted: these are smaller than mast mounted systems and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1kW to 2kW in size. Wind turbines are eligible for the UK government's Feed-in-Tariffs which means money can be earned from the electricity generated by the turbine. Payments for the electricity not use and export to the local grid are available as well. To be eligible, the installer and wind turbine product must be certified under the Microgeneration Certification Scheme (MCS). If the turbine is not connected to the local electricity grid (known as off grid), unused electricity can be stored in a battery for use when there is no wind. Please note that the Feed-in Tariffs scheme is not available in Northern Ireland.

Wind Turbines have been considered for this project, Pole mounted wind turbine has been excluded due to nature of the development and building mounted would not achieve the required reductions on site to meet the local requirements, therefore this has not been explored further.

Biomass

Biomass boilers work by combusting sustainably sourced wood pellets to produce heat for your home.

The most common biomass materials used include wood pellets, chips, logs or other biological materials. The wood material is placed into the biomass boiler either by hand manually, or with the use of an automated combustion chamber feeder, where they are then ignited. Unlike conventional boilers, biomass boilers are much larger, which is one of their key differences.

Biomass been considered for the project, in order to house the system, an external additional plant area would be required and therefore the feasibility of this technology has not been deemed acceptable or viable due to planning restrictions.

Solar Thermal

Solar thermal panels use heat from the sun to warm fluid passing through them.

There are two main types of solar water heating panels – **flat plate** and **evacuated tubes** (referring to the way the water interacts with the panel). Evacuated tubes look like a bank of glass tubes fitted to your roof. Flat plate systems can either be fitted onto the roof or integrated into it. Evacuated tube systems are more efficient than flat-plate versions, so are often smaller but still generate the same amount of hot water.

Solar Thermal Panels have been considered and have not been deemed viable for this site. Solar Thermal alone would not contribute enough of a reduction of the carbon emissions to satisfy the local authorities planning criteria. However, Solar Thermal may be reconsidered if used in conjunction with other low carbon technologies.

Feasibility Overview

Technology	Feasibility	Implemented In Design
Solar Pv	**Not Feasible**	**No**
Ground Source Heat Pump	**Not Feasible**	**No**
Air Source Heat Pump	**Feasible**	**Yes**
Wind Energy	**Not Feasible**	**No**
Biomass	**Not Feasible**	**No**
Solar Thermal	**Could be considered in conjunction with other technologies.**	**No**

The feasibility study above concludes that an **Air Source Heat Pump** is the most appropriate action in achieving the minimum reduction of at least 20% set-out in The Bristol Local Plan. The design has been calculated via SAP10 design software and has produced the figures below:-

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-0.3	-57%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	100%
Cumulative on site savings	**0.3**	**43%**

Additional Policies:

Flood Risk, Drought & Surface Run-off

Waste & Recycling

Minimising Site Waste

Pollution

Biodiversity

Sustainable Transport

Building Regulations M4 (2) / (3)

Water Usage

The applicant will reduce the consumption of potable water within the proposed dwelling/s from all sources to be in use, this will be achieved by design and selection of sanitaryware and flow restrictors where required. Water efficiency calculations are to be completed in accordance to Building Regulations Part G and are set to achieve requirements set by the Local Authority and further improve on these figures to achieve **110 L/pp/pd.**

Conclusion

To summarise, following the study above, **Air Source Heat Pump** has been identified as the most feasible option to achieve the carbon reduction set-out by the local authority. Other low carbon technologies have been identified as viable when used in conjunction with each other and should be reconsidered if the initial design is deemed unfit due to unforeseen planning restrictions.

Policy & Requirements

- Policy BCS14 of The Bristol City Local Plan

Be Lean Summary

Element	U-Value (W/m2K)	
	Part L Limiting Factor	Development
Ground Floor	0.25	0.22
External Facade	0.30	0.28
Ceiling	0.16	0.15
Glazing	1.6	1.4
Doors	1.6	1.4

Element		
	Part L Limiting Factor	Development
Low Energy Lighting	75%	100%

Element		
	Part L Limiting Factor	Development
Air Permeability	8	7

	Target Fabric Energy Efficiency (kWh/m²)	**Dwelling Fabric Energy Efficiency (kWh/m²)**	**Improvement (%)**
Development total	37.66	68.49	-81.87%

Summary of Zero or Low-Carbon Measures

- Main Heating System: Vaillant 5kw ASHP per dwelling
- Hot Water System: 140 Litre Cylinder
- Renewable Technologies: N/A
- MVHR: N/A

Summary of Be Green Measures

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-0.3	-57%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	100%
Cumulative on site savings	**0.3**	**43%**

Appendix A – SAP Results

Summary for Input Data

Property Reference	Unit 1 - 144/144a Whitehall Rd	Issued on Date	07/02/2025
Assessment Reference	Conversion	Prop Type Ref	Conversion
Property	Unit 1, 144/144a, Whitehall Road, Bristol, BS5 9BP		

SAP Rating	75 C	DER	8.02	TER	14.16
Environmental	95 A	% DER < TER			43.36
CO_2 Emissions (t/year)	0.3	DFEE	68.49	TFEE	37.66
Compliance Check	See BREL	% DFEE < TFEE			-81.87
% DPER < TPER	-12.71	DPER	84.23	TPER	74.73

Assessor Details	Mr. Alexander Cotterill	Assessor ID	AV67-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	227.58	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.99 m	42.36 m²	2.75 m

8.0 Living Area 20.50 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.28	9.00	26.24	19.35	0.00	None	6.89	Enter Gross Area
Commercial Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.28	9.00	19.98	19.98	0.00	None	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Solid Wall	Single plasterboard on both sides, dense cellular blocks, cavity	0.00	70.00	39.16		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	71.17

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.15	9.00	1.23	1.23	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings