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BEYOND BUILDING

Energy Statement

Land Rear of 117 High Street, Dilton Marsh

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EXECUTIVE SUMMARY

This Energy Strategy has been produced by Energist UK on behalf of Redcliffe Homes Limited ('the Applicant'). It supports a planning application for the residential development at Land Rear of 117 High Street, Dilton Marsh ('the Development'). This application is an outline application, PL/2023/01880 (Appeal Ref: APP/Y940/W/24/3352160) underway with Wiltshire Council.

The development proposals comprise the construction of 54 new homes, consisting of a mix of detached, semi-detached and terraced housing, as well as a few maisonettes.

The Applicant has adopted a sustainable design approach, incorporating efficient Low and Zero-Carbon (LZC) technologies to ensure compliance with [The Climate Change Act \(2008\)](#) and the [National Planning Policy Framework \(2024\)](#).

The Applicant will successfully deliver [Wiltshire Core Strategy \(2015\)](#) planning policy, with reference to [Policy CP 41 - Sustainable Construction and Low Carbon Energy](#).

The Applicant has committed to a design approach that aligns with the principles of the [Energy Hierarchy](#). The development has been optimised to minimise on-site emissions by incorporating high-performance building fabric, innovative design, and advanced heating systems, resulting in a significant reduction in CO₂ emissions.

The development is expected to achieve a 69.9% reduction in regulated carbon dioxide (CO₂) emissions beyond the Target Emission Rate (TER) set by [Approved Document Part L \(AD L\) 2021](#), through the proposed measures.

Table 1 below summarises the measures implemented to meet the prescribed energy performance.



Table 1 — Measures incorporated to deliver the energy standard

Fabric	Energy-efficient building fabric and insulation to all heat loss floors, walls and roofs: ▪ External Wall U-Value: 0.18 W/m².K ▪ Ground Floor: 0.12 W/m².K ▪ Party Wall: 0 W/m².K (<i>fully filled and sealed</i>) ▪ Roof: 0.08 and 0.12 W/m².K ▪ External Door: 1.20 W/m².K ▪ Glazing — double-glazed units: — Glazing U-Value: 1.10 W/m².K — Glazing G-Value: 0.64 ▪ Design Air Permeability: 4.00 m³/m²hr @50 Pa ▪ Thermal Bridging: Bespoke psi-values
Building services	▪ Lighting: Low-energy lighting throughout the building — 80 lm/W ▪ Ventilation: Intermittent Extract Fans ▪ Space heating and hot water: — Individual ASHPs will be installed to all plots — Space Heating Controls: Time and temperature zone controls



In line with the strategy outlined above, the effectiveness of the design measures, along with the low-carbon and renewable energy solutions, in fulfilling the Applicant's commitment to the [Energy Hierarchy](#), is demonstrated Figure 1 below.

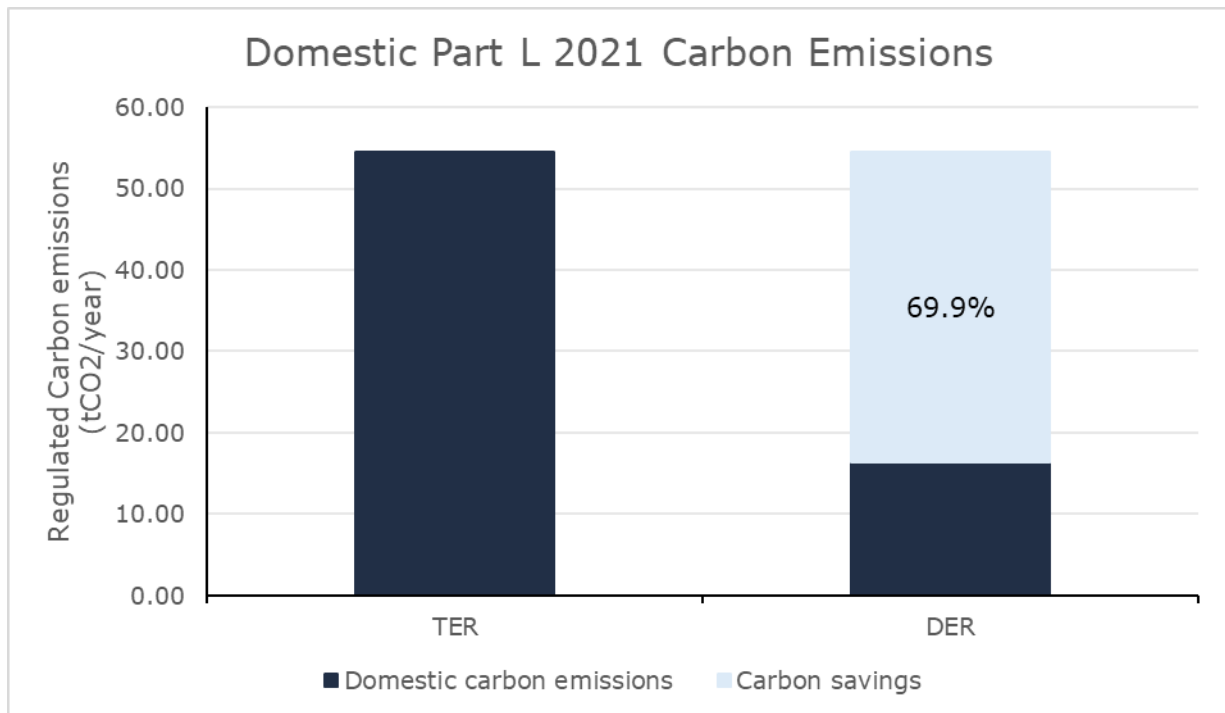


Figure 1 — How the Development delivers the energy hierarchy



1. INTRODUCTION

1.1 Site Description

The proposed development is residential and is situated within the jurisdiction of the Wiltshire Council. The proposal is for 54 dwellings consisting of a mix of detached, semi-detached and terraced housing, as well as a few maisonettes.



Figure 2 — The proposed site plan for Land Rear of 117 High Street, Dilton Marsh
[Source: thrive architects – P9. REDC250804]

1.2 Purpose of the Energy Strategy

This Energy Strategy has been produced by Energist UK on behalf of Redcliffe Homes ('the Applicant'). It outlines climate change mitigation measures for the development at Land Rear of 117 High Street, Dilton Marsh.



This Energy Strategy demonstrates the approach adopted by the Applicant to comply with:

- i) [The Climate Change Act \(2008\)](#).
- ii) [National Planning Policy Framework \(2023\)](#).
- iii) [Wiltshire Core Strategy \(2015\)](#):
 - [Policy CP 41 - Sustainable Construction and Low Carbon Energy](#).

The way in which the Applicant meets the energy standard and achieves CO₂ reductions at Land Rear of 117 High Street, Dilton Marsh will be explained in further sections of this report.

1.3 Methodology

Energy Hierarchy

The [Wiltshire Core Strategy \(2015\)](#) encourages design in line with the principles of the energy hierarchy. The principles and priorities of the energy hierarchy are outlined below.

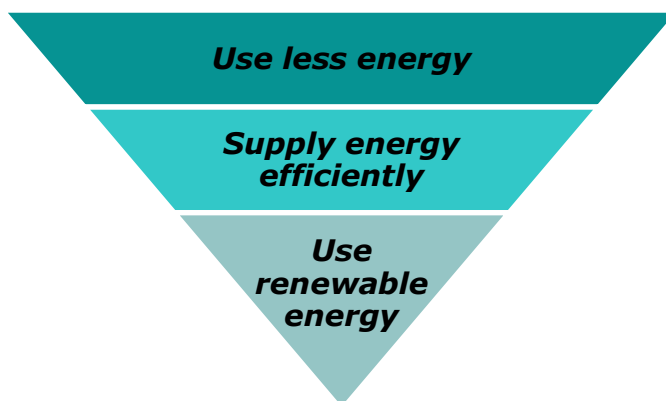


Figure 3 — Three-tier Energy Hierarchy



This Energy Strategy is assessed against, and presented, to align with the following steps:

1. The Baseline

The Baseline represents the minimum energy performance that a building must achieve to comply with the relevant building regulations, specifically AD L 2021. It sets TER, which is the benchmark for CO₂ emissions based on a standard building of similar type, size, and use. The Baseline is not an active step in the energy hierarchy, but rather it serves as a reference point. All subsequent measures in the hierarchy are assessed against this Baseline to demonstrate how much the proposed development improves upon the regulatory minimum standards.

2. Reduced Energy Demand

The first step involves reducing energy demand through energy efficient design and operational measures. This includes improving building insulation, reducing air leakage, and optimizing the efficiency of energy systems. The aim is to minimize the amount of energy required in the first place.

3. Renewable and Low Carbon Technologies

The next step in the hierarchy focuses on using renewable energy sources to meet the remaining energy needs. The goal is to further reduce carbon emissions by replacing fossil fuels with LZC energy sources.

1.4 Assessment Methods

The estimated energy performance of the development has been calculated using SAP 10.2 methodology. This assessment includes representative residential dwellings from each domestic home type configuration.

SAP Assessment (Domestic Dwellings)

The SAP methodology has been used to calculate the regulated energy demands associated with hot water, space heating, and fixed electrical items. Part L1 has been applied for the new-build energy assessment, ensuring compliance with relevant regulations. A total of 4 sample SAP assessments has been conducted and extrapolated across 54 dwellings to estimate TER and DER. A mix of property types has been assessed to ensure an accurate representation of the proposed development.



The sample size selected is considered appropriate for extrapolation across the development.



2. BASELINE: BUILDING REGULATIONS

2.1 Introduction

To assess the effectiveness of demand-reduction measures, it is first necessary to establish the baseline energy demand (referred to as TER).

The AD L 2021 TER for the development has been calculated using Part L model designs, applied to the Applicant's development details. The TER represents the maximum allowable regulated CO₂ emissions for the development to achieve compliance with AD L 2021.

2.2 Development's Baseline

The resulting TER for the development has been calculated as 54.89 tCO₂/year for the development. To ensure compliance with AD L 2021, CO₂ emissions should not exceed this figure.

Table 2 — Development's Target Emission Rate for the Development.

	<i>CO₂ emissions</i>	
	<i>tCO₂/year</i>	<i>% reduction</i>
Target Emission Rate: Compliant with AD L 2021	54.89	-



3. REDUCED ENERGY DEMAND

3.1 Introduction

The development incorporates a high-quality, sustainable design by integrating both passive and active measures to minimise energy demand. These include:

- Energy-efficient building fabric and insulation for all heat loss floors, walls, and roofs, reducing heat demand.
- High-performance glazing throughout the development.
- Enhanced build quality, ensuring good air-tightness results to minimise heat loss.
- Efficient building services.
- Minimised cold bridging, achieved through bespoke psi-value calculations.
- Low-energy lighting installed throughout the development.

By optimising the thermal envelope, the need for space heating is significantly reduced, as heat transmittance through thermal elements is minimised. Additionally, low air permeability rates help to lower heating demand by reducing air infiltration, thereby limiting heat losses in winter and excessive heat gains in summer.

Adopting a 'fabric first' approach, the building fabric has been carefully designed and specified to meet or exceed current Building Regulations requirements. This, combined with an energy-efficient plant specification, forms the basis of the design strategy.



Table 3 — Design specification for the Development

Element	Proposed Design Specification
External Wall U-Value (W/m ² .K):	0.18
Ground Floor (W/m ² .K)	0.12
Party Wall U-Value (W/m ² .K)	0 (fully filled and sealed)
Roof (Flat) U-Value (W/m ² .K)	0.08
External Door U-Value (W/m ² .K)	1.20
Glazing U-Value (W/m ² .K)	1.10 (double-glazed units)
Glazing G-Value	0.64
Design Air Permeability (m ³ /m ² hr @50 Pa)	4.0
Thermal Bridging	Bespoke psi-values
Lighting (lm/W)	80
Ventilation	Intermittent extract fans
Space Heating ¹	92.3% efficient gas boiler
Hot Water Heating	From the main heating system
Space Heating Controls	Time and temperature zone controls

¹ By using a standard system like gas boilers in the initial stage, a consistent baseline is established to measure the energy savings achieved solely through improvements in the building's fabric. This approach ensures that any reductions in energy demand are due to the efficiency of the building design itself, rather than the heating system. This standardisation allows for a like-for-like comparison of energy performance across different buildings or design options. Additionally, ventilation and lighting are assessed in this stage as they significantly impact the building's overall energy efficiency. The actual heating system, along with renewable technologies, is introduced in later stages to enhance these foundational efficiencies.

Notional PV is then manually adjusted into the calculations in line with the standard practice. This allows the effectiveness of fabric measures to be assessed as a percentage reduction in CO₂ emissions over the baseline for both domestic and commercial elements of the Development separately.



3.2 Fabric Energy Efficiency Standard

The total Part L Fabric Energy Efficiency Standard (FEES) is provided for the development as a whole and set out in the table below. The FEES target is the maximum energy demand for the dwellings.

DFEE (Dwelling Fabric Energy Efficiency) is the actual fabric energy efficiency achieved by a dwelling, measured in kWh/m²/year. It reflects how well the building fabric (walls, floors, roof, windows, doors, and airtightness) minimises energy demand for space heating.

The 2.9 % improvement indicates that the building fabric performs well and helps to minimise the initial energy demand, in line with the energy hierarchy.

Table 4 — Site-wide total energy demand from dwellings.

	<i>Target Fabric Energy Efficiency (kWh/m²)</i>	<i>Dwelling Fabric Energy Efficiency (kWh/m²)</i>	<i>Improvement (%)</i>
Residential element's total energy demand	37.49	36.39	2.9%



4. RENEWABLE AND LOW-CARBON ENERGY TECHNOLOGIES

4.1 Introduction

In line with planning policy CP 41 of [Wiltshire Core Strategy \(2015\)](#), the applicant should commit to the integration of LZC technologies within their energy strategy for the development.

Viability of the following low-carbon and renewable energy technologies have been considered:

- wind,
- solar,
- aerothermal,
- geothermal,
- water source heat pumps,
- biomass.

A detailed review of these technologies is provided in Appendix 2. Table 5 summarises the LZC technologies considered viable for the development:

Table 5 — Summary of Feasibility for the Development

✓	<i>Solar Thermal</i> <i>Solar PV</i> <i>Air Source Heat Pumps</i>
X	<i>Wind Turbines</i> <i>Biomass Boilers</i> <i>Ground or Water Source Heat Pumps</i>

The Applicant has adopted a strategy for LZC technologies that is compatible with previously detailed specification elements.



AIR SOURCE HEAT PUMPS

Following the implementation of design measures to minimise energy demand, the development will utilise heat pump technology to provide low carbon heating and hot water to all plots on site. Individual ASHPs will be installed per dwelling.

SOLAR THERMAL / SOLAR PV

Whilst technically feasible, the applicant has opted not to pursue the incorporation of solar thermal or PV. The decision was made to incorporate ASHP technology as the low zero carbon energy source in combination with significant improvements to the fabric specification above Part L notional design. Significant investment was made to a fabric first approach to make the dwellings more comfortable for occupants, as well as ensuring that the risk of fuel poverty is reduced, rather than the reliance on bolt-on technologies such as solar PV. The incorporation of ASHP technology is aligned with the upcoming changes in the building regulations, which seeks to move away from the reliance on fossil fuels as well as removing the need for on-site combustion.



4.2 Development's LZC Performance

At the final stage, the estimated CO₂ emissions for the development are 16.38 tCO₂ per annum for the residential dwellings.

This equates to a reduction of 38.11 tCO₂ per annum for the residential element, representing a 69.9% improvement over the baseline.

For detailed SAP results, please refer to Appendix 3.

Table 6 — Development's carbon emissions for the Development.

	<i>CO₂ emissions</i>	
	<i>tCO₂/year</i>	<i>% reduction</i>
Target Emission Rate: Compliant with AD L 2021	54.49	-
<i>After demand-reduction measures and renewable and low carbon technologies</i>	16.38	69.9%



5. MAINS WATER CONSUMPTION

5.1 Introduction

Water consumption in residential properties significantly impacts both operational running costs (e.g., water charges) and energy usage, particularly for domestic hot water heating. This is recognised in the SAP 10.2 methodology, which assumes reduced energy consumption for dwellings that comply with [Approved Document Part G](#).

5.2 Development's Water Consumption

The Applicant will implement water-efficient fixtures and fittings across the development to minimise water demand. Each dwelling will be designed to achieve a water consumption rate of 110 litres per person per day, excluding an additional allowance of up to 5 litres per person per day for external water use.

The 110 litres per person per day standard will be achieved through the specifications outlined in Table 16. For further details, please refer to Appendix 5.



Table 7 — Sample water-efficiency specification for a typical dwelling.

Water fittings	Performance
Kitchen taps flow rate	8.0 Litres per minute
Other basin taps flow rate	6.0 Litres per minute
WCs flush volume (full/part)	4.0/2.6 Litres
Shower flow rate	8 Litres per minute
Bath volume	155 Litres
Dishwasher water consumption	1.3 litres per place setting
Washing-machine water consumption	8.2 litres per kg



6. SUSTAINABLE TRANSPORT

The Development will ensure connectivity within the site and to the surrounding area, including integrating with existing transport networks. This helps to ensure ease of movement for residents and supports the use of sustainable transport modes.

There will also be a provision for EV charging in line with relevant policy and building regulations.

A separately submitted Transport Statement contains further details.



7. EMBODIED CARBON

7.1 Sustainable Material Selection

The impact of materials selection is an important consideration when designing a new development. The energy and natural resources consumed over the course of extraction or procurement, processing and manufacturing can be significant.

The Applicant will implement an environmentally responsible approach to the procurement of construction materials and supply chain management for the development where possible.

Good-practice principles for the responsible sourcing of sustainable materials will be applied across the Development. The life cycle impact of materials will be considered.

The applicant constantly reviews and responds to material suppliers based on sustainability and carbon credentials. Their key providers for this site have been summarised below.

The key facing material for this site is Bekstone and they promote high levels of sustainability through the manufacturing process.

"Bekstone recognises it has a responsibility to minimise the impact caused by its operations and supply chain on the climate. As such we continue to review, measure and monitor our operational procedures so that we continue to make improvements to reduce emissions that contribute towards Climate Change. This policy is implemented in accordance and conjunction with our Environmental Policy.

Bekstone ensures that it meets the legal responsibilities covered by the Environmental Protection Act 1990 (EPA). The Integrated Pollution Control and Air Pollution Control by Local Authorities measuring the impact of our operations on the local air, water and land and ensuring we operate within the approved guidelines.

Actions undertaken and being undertaken to improve upon our basic local and legal requirements include:

A change to 100% 'green' electricity at our production plants and offices in January 2008. Electricity that is used to power our production machinery, light, heat and general power is supplied from renewable resources via generation which is Climate Change Levy exempt.



Sources which contribute include wind turbines and hydro electric schemes. Audited by Lloyds Register Quality Assurance within ISO 9001 : 2000.

We have spent many years working with the Carbon Trust in order to minimise our carbon output and our reductions have been certified. Measuring carbon output helps us to create changes to our manufacturing and supply chain activities in order to continue to reduce the amount of carbon we produce. In doing this we are able to demonstrate our progress and positive contribution towards the slowing of climate change."

All timber including the frame is responsibly sourced to lower emissions. The timber frames are provided by Taylor Lane and they strive to reduce carbon from the overall manufacturing process. They set out that:

"As such, we are working towards net zero.

To achieve this, we have formed a Corporate Social Responsibility Taskforce. Representatives from all departments meet regularly to discuss our journey to net zero, address immediate concerns, long-term targets, and agree and implement actions. It is an open forum and anyone from within the business is welcome.

For greater accountability, we have also joined Greener Footprints 30 for 2030 campaign. Launched by the Herefordshire Climate and Nature Action Partnership, we are tracking our progress alongside 29 other Herefordshire-based businesses, and in turn, we are playing our part in helping the county realise its ambition to be net zero by 2030.

Positive actions include installing solar photovoltaic panels on the roof of our office, electric cars for directors and sales staff, installation of energy efficient lighting in the factories, replacing company vehicles with bicycles for staff to make short journeys between company premises on Rotherwas Industrial Estate, and employing an ambitious recycling programme. The latter is supported by third-party supplier, Hereford's Pedicargo Recycling Service which collects trade waste by bike that is then compacted, shredded and recycled."

All windows are provided by Munster joinery and they set out that:

"We are conscious of the importance of sustainability and strive to continually improve our operations with this in mind. Munster Joinery use green energy. Wind turbines and biomass CHP power our manufacturing plant and we have robust recycling and water treatment practices in place.



At Munster Joinery we recognise the increasing importance of waste management and recycling in the joinery industry. We have a dedicated 'waste management and recycling' division. As a company we are fully self reliant in dealing with all waste and packaging products and all recyclable materials on site. We have also developed an integrated approach to resource efficiency to ensure the most effective use of natural resources.

We consider sustainability in the selection of the materials that go into our products. The Life Cycle analysis of our products examines environmental impacts due to extraction, production, embodied energy, durability and service life, maintenance and repair, end of life disposal. We are in the process of developing and publishing EPDs for all our products.

We are conscious of the need to reduce our carbon footprint and manage our natural resources effectively. Our production facility in Ballydesmond gets much of it's day to day power needs from 2 wind turbines with an electrical output of 4.2 megawatts and a Biomass steam turbine with an electrical output of 2.8 megawatts. The wind turbines are capable of powering 2,260 homes annually. The installation will easily achieve annual savings of over 9,000 tonnes of carbon emissions showing Munster Joinery's commitment to protecting our environment."



7.2 Material Efficiency & Waste Reduction

The Applicant will implement guidance on sustainable waste management. As a primary objective, and in accordance with the waste hierarchy, the Applicant will seek to prevent waste in the first instance. This will be achieved through a site waste management plan.

This is key with around a third of the UK's waste coming from the construction and demolition sector. The Applicant will work with a principal contractor in order to deliver the objective of reducing the proportion of waste diverted to landfill. The Applicant will monitor and review this commitment by defining the following:

- Waste minimisation actions to be undertaken.
- Procedures for minimising hazardous waste.
- Procedures for sorting, reusing, and recycling construction waste into defined waste groups, either on-site or through a licensed external contractor. The delivery of this target will be managed through the effective implementation of an on-site plan that will focus on steps in the waste hierarchy.

Redcliffe Homes implement precision construction techniques and modular design to reduce waste.

All sites including this Development will utilise timber frames and standard house typologies. This modular style construction significantly reduces waste given much of the construction is undertaken off-site under a controlled environment.

The use of timber frame panels creates an efficient design, accurate production and process as well as a quicker watertight dwelling on site. The efficiency in timber frame design and reduces building errors, waste in production and on site. The optimised structural designs reduce the materials used and also creates a lighter construction and reduced substructure design.

The use of reusing the same house design and type of construction ensures efficiency through repetition, familiarisation and designing out complex issues.

The external facing materials are still undertaken onsite, although the standard house types together with using the same labourers means that material wastage is limited.

Further details will be provided within the waste management plan.



7.3 Local Sourcing & Transportation Efficiency

Redcliffe Homes prioritize local suppliers to cut down on transportation emissions.

The key materials largely all come from less than 100 miles away from the development as summarised below:

- Bricks – Ibstock, various quarries nationally including Bristol (approx. 58 miles via road)
- Stonework – Bekstone, Brize Norton, Oxfordshire (approx. 64 miles via road)
- Tiles – Marley, Staffordshire, Midlands (approx. 145 miles via road)
- Timber frame, Taylor Lane, Hereford, Midlands (approx. 90 miles via road)
- Windows – Munster joinery manufactured in Warwick, Midlands (approx. 79 miles via road)
- Doors – IG Doors, Caerphilly, South Wales (approx. 93 miles via road)

Given the geographical constraints and limited population within the Wiltshire area, there is a limited manufacturing base within Wiltshire and the South West. This means that materials need to be sought from further away than just the South West, although as is set out above, Redcliffe Homes has kept this as local as possible.

In terms of trades and workers, Redcliffe Homes have a company policy to only develop sites within 1 hour from the company head office in Chipping Sodbury to avoid unnecessary travel times. When meetings are required on-site, the company strongly encourages car sharing amongst staff.

At this stage, the specific trades are not known. However, all trades for the site will come from the local area and will only expand as far as Swindon, Bristol and Gloucester.

Whilst Redcliffe Home will strongly encourage to use of trades from Wiltshire, there is a limited supply meaning that they may need to be brought in from cities listed above.



7.4 Circular Economy Approach

Redcliffe Homes will seek to incorporate reclaimed and recyclable materials to extend material life cycles and reduce landfill waste.

The key focus of this will relate to soil and hardcore, where this will be reused as much as possible to avoid unnecessary and costly disposal.

Given Redcliffe Homes are developing several sites in this area, there will be the opportunity to share soil and hardcore to avoid additional resources being imported to site.



8. CLIMATE CHANGE ADAPTATION

The Applicant has taken a high standard of energy efficiency including optimal levels of thermal insulation and passive ventilation. The Applicant has designed a Development which enhances the existing qualities of the surrounding area whilst also making positive steps towards mitigating and adapting to climate change.

The Applicant addresses their potential impact on climate change by designing a development that reduces energy demand and, in doing so, takes positive action towards meeting their CO₂ reduction target. The development has been designed to take positive steps towards zero carbon, through the use of ASHPs for the heating and hot water, meeting the requirements for low carbon heating solutions and the use of renewable technology.

The Development has been designed to encourage walking, cycling and the use of public transport. Full details can be found in the separate Transport Statement.

Outdoor space will be provided for all properties, along with public open space improving quality of life for all occupants.

Policies and procedures will be put in place by the Applicant to in order to minimise the possible negative effects of construction, such as air pollution, noise and vibration, traffic congestion, dust and contamination of land and water.

The Development will be designed to achieve airborne sound insulation beyond Part E of the Building Regulations for party walls.

All dwellings will be designed in line with Part O of the Building Regulations, to ensure that overheating risk is minimised.

Any artificial lighting proposed for the Development will be designed to meet the local plan policy, measures will be taken where possible to reduce light pollution on site.

A Flood Risk Assessment has confirmed the site is in Flood Zone 1, with a large section of the site unaffected by surface water flooding. A surface water drainage strategy has been incorporated into the proposed layout in order to manage any adverse impacts on surface water runoff as a result of the Development. The SuDS outlined in the FRA also provide community and environmental benefits to the Development.



CONCLUSIONS AND RECOMMENDATIONS

The development delivers a highly efficient and sustainable energy strategy, meeting the requirements of national and local planning policy, including CP 41 of the [Wiltshire Core Strategy \(2015\)](#).

By integrating passive design measures, efficient energy supply, and renewable technologies, the development achieves a total site-wide reduction of 69.9% in regulated CO₂ emissions, representing a significant carbon reduction over minimum requirements.

The strategy follows the principles of the [Energy Hierarchy](#).

- 'Optimised building fabric, energy-efficient glazing, low-energy lighting, and minimum thermal bridging result in a low energy demand design.
- Individual ASHP systems will provide space heating and hot water and will contribute to further carbon reductions compared against regulatory requirements.
- Overall reductions of 69.9% over Part AD L 2021.

The development also aligns with nutrient neutrality principles, in particular by reducing the potential water usage of future inhabitants. An aspirational target of 110 litres per person per day has been targeted and achieved with the proposed fittings specification.

A number of sustainability measures have also been identified and incorporated within the design, in particular with regards to sustainable transport, embodied carbon and climate change adaption.

This strategy highlights that the development will meet local and regional energy policies, delivering a sustainable and future-proofed energy solution.



APPENDICES

APPENDIX 1: LIST OF ABBREVIATIONS

AD L 2021	<i>Approved Document Part L of Buildings Regulations 2021</i>
AD O 2021	<i>Approved Document Part P of Buildings Regulations 2021</i>
ASHP	<i>Air Source Heat Pump</i>
BER	<i>Building Emission Rate</i>
BRE	<i>Building Research Establishment</i>
CIBSE	<i>Chartered Institution of Building Services Engineers</i>
COP	<i>Coefficient of Performance</i>
DER	<i>Dwelling Emission Rate</i>
DHN	<i>District Heat Network</i>
DHW	<i>Domestic Hot Water</i>
EAHP	<i>Exhaust Air Heat Pump</i>
EVC	<i>Electric Vehicle Charging</i>
FEES	<i>Fabric Energy Efficiency Standard</i>
LZC	<i>Low and Zero-Carbon technologies</i>
NCM	<i>National Calculation Methodology</i>
PV	<i>Photovoltaics</i>
SAP	<i>Standard Assessment Procedure</i>
SBEM	<i>Simplified Building Energy Model</i>
TER	<i>Target Emission Rate</i>
TFEE	<i>Target Fabric Energy Efficiency</i>
VRF	<i>Variable Refrigerant Flow</i>



APPENDIX 2: PLANNING POLICY AND DESIGN GUIDANCE

The Climate Change Act (2008)

Passed in November 2008, the Climate Change Act mandated that the UK would reduce emissions of six key greenhouse gases, including Carbon Dioxide, by 80% by 2050.

As a consequence, the reduction of carbon dioxide emissions is at the forefront of National, Regional and Local Planning Policy, along with continuing step changes in performance introduced by the Building Regulations Approved Document L (2021).

Approved Document L (2021)

This development is subject to the requirements of Approved Document L (2021). ADL 2013 represented an approximate reduction of 6% in the Target Emission Rate (kgCO₂/sqm per annum) over the requirements of Approved Document L (2010) for residential development and an aggregate 9% reduction for non-residential development. ADL (2021) has seen a further 31% improvement over these targets. It also sees the introduction of a Primary Energy Target, a measure of heating demand (kW hrs/sqm per annum) to ensure new-build dwellings with low-carbon heating systems still meet satisfactory energy-efficiency standards.

National Planning Policy Framework (2024)

The National Planning Policy Framework (NPPF) encourages Local Planning Authorities to 'support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. I ' (NPPF paragraph 161), 'Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures '. (NPPF Paragraph 162).

Paragraph 165, upholds the requirement for Local Plans to: 'To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for locating potential heat customers and suppliers.

In paragraph 166, NPPF stipulates that local planning authorities should take account of the benefits of decentralised energy and passive design measures as a means of energy efficiency in new development: 'In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.'



Wiltshire Core Strategy (2015)

CP 41 Sustainable construction and low-carbon energy

Climate change adaptation

New development, building conversions, refurbishments and extensions will be encouraged to incorporate design measures to reduce energy demand.

Development will be well insulated and designed to take advantage of natural light and heat from the sun and use natural air movement for ventilation, whilst maximising cooling in the summer.

Sustainable construction

New homes (excluding extensions and conversions) will be required to achieve at least Level 4 (in full) of the Code for Sustainable Homes.

Conversions of property to residential use will not be permitted unless BREEAM's Homes "Very Good" standards are achieved.

All non-residential development will be required to achieve the relevant BREEAM "Very Good" standards, rising to the relevant BREEAM "Excellent" standards from 2019.

Existing buildings

Retrofitting measures to improve the energy performance of existing buildings will be encouraged in accordance with the following hierarchy:

- i. Reduce energy consumption through energy efficiency measures
- ii. Use renewable or low-carbon energy from a local/district source
- iii. Use building-integrated renewable or low-carbon technologies.

Opportunities should be sought to facilitate carbon reduction through retrofitting at whole street or neighbourhood scales to reduce individual costs, improve viability and support coordinated programmes for improvement.

Renewable and low-carbon energy

All proposals for major development will be required to submit a Sustainable Energy Strategy alongside the planning application outlining the low-carbon strategy for the proposal.

In all cases, including those listed above, proposals relating to historic buildings, listed buildings and buildings within conservation areas and world heritage sites should ensure that appropriate sensitive approaches and materials are used.

Safeguarding of the significance of heritage assets should be in accordance with appropriate national policy and established best practice.

In all cases the impact of these requirements on the viability of development will be taken into consideration



APPENDIX 3: SAP RESULTS

SAP 10.2 Compliance Sheets provided separately.



APPENDIX 4: LZCT ASSESSMENT

Please refer to the following page for Viability of the following low-carbon and renewable energy technologies:

- i) wind,*
- ii) solar,*
- iii) aerothermal,*
- iv) geothermal,*
- v) water source heat pumps,*
- vi) biomass.*



i) Wind

Wind	<i>The ability to generate electricity via a turbine or similar device which harnesses natural wind energy. This could be considered as an onsite solution to reducing carbon emissions (turbines included within the development), or offsite (investing financially into a nearby wind farm).</i>
Installation considerations	– Wind turbines come in a variety of sizes and shapes. Turbines of 1 Kw can be installed to single house and large-scale turbines of 1-2 MW can be installed on a development to generate electricity to multiple dwellings and other buildings. In both instances the electricity generated can be used on site or exported to the grid. Vertical- or horizontal-axis turbines are available. – A roof-mounted 1 kW micro wind system costs up to £3,000. A 2.5 kW pole-mounted system costs between £9,900 and £19,000. A 6 kW pole-mounted system costs between £21,000 and £30,000 (taken from the Energy Saving Trust, TBC by supplier) – Local average wind speed is a determining factor. A minimum average wind speed of 6 m/s is required. – Noise considerations can be an issue dependent on density and build-up of the surrounding area. – Buildings in the immediate area can disrupt wind speed and reduce performance of the system. – Planning permission will be required along with suitable space to site the turbine, whether ground installed, or roof mounted.
Advantages	– Generation of clean electricity which can be exported to the grid or used onsite. – Can benefit from the Feed in Tariff, reducing payback costs.
Disadvantages	– Planning restrictions and local climate often limit installation opportunities. – Annual maintenance required. – High initial capital cost. It is usual for an investor to consider a series of turbines to make the investment financially sound.
Development feasibility ✗	– Installing a large turbine in an area such as this is not considered to be appropriate due to its appearance and physical impact on the built-up environment. Residents' and neighbours' concerns may include the look of the turbine, the hum of the generator and the possibility of stroboscopic shadowing from the blades on homes. – Wind speed has been checked for the development scheme using the NOABL wind map: – http://www.rensmart.com/Weather/Maps. The wind speed at ten metres for the development scheme is 4.7 metres per second (m/s) which is below the minimum of 5 m/s and threshold for technical viability. – Typical payback times for a single turbine are expected to be greater than 15 years which means that the cost of installing and maintaining a single wind turbine is not considered a commercially viable option.



ii) Solar PV and/or Solar Thermal

Solar PV Solar Thermal	<i>The ability to generate energy (either electricity, hot water or a combination of the two) through harnessing natural solar energy. This could include the use of solar thermal panels, photovoltaic (PV) panels, or a combined solution. PV panels, similarly, to turbines, can be considered both on and offsite.</i> <i>Solar Photovoltaics convert solar radiation into electricity which can be used on site or exported to the national grid.</i> <i>Solar Thermal generates domestic hot water from the sun's radiation. Glycol circulates within either flat plate or evacuated tube panels, absorbing heat from the sun, and transferring this energy to a water cylinder. A well-designed solar thermal system will account for 50-60% of a dwelling's annual hot water demand. Sizing the system to meet a higher demand will lead to excess heat generation in the summer months and overheating of the system.</i>
Installation considerations	– <i>Operate most efficiently on a south-facing sloping roof (between 30- and 45-degree pitch.)</i> – <i>Shading must be minimal (one shaded panel can impact the output of the rest of the array.)</i> – <i>Panels must not be laid horizontally on a flat roof as they will not self-clean. Panels will therefore need to be installed at an angle and with appropriate space between them, to avoid over-shading.</i> – <i>Large arrays may require upgrades to substations if exporting electricity to the grid.</i> – <i>Local planning requirements may restrict installation of panels on certain elevations.</i> – <i>Installation must take into account pitch and fall of the roof, along with any additional plant on the roof to ensure there is sufficient room.</i> – <i>The average domestic solar PV system is 4kWp and costs £5,000 - £8,000 (including VAT at 5 per cent) - (taken from the Energy Saving Trust).</i>
Advantages	– <i>Relatively straightforward installation, connection to landlord's supply and metering.</i> – <i>Linear improvement in performance as more panels are installed.</i> – <i>Installation costs are continually reducing.</i> – <i>Can benefit from the Feed in Tariff to improve financial payback.</i>
Disadvantages	– <i>Less appropriate for high-rise developments, due to lack of roof space in relation to total floor area.</i> – <i>With Solar Thermal, performance is limited by the hot water demand of the building – system oversizing will lead to overheating.</i>



Development feasibility ✓	– The suitability of Solar panels has been considered for this Development and are concluded as a technically-viable option. – There are potential areas of roof space suitable for the positioning of unshaded Solar PV arrays.
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iii) Aerothermal

Aerothermal	The transfer of latent heat in the atmosphere to a compressed refrigerant gas to warm the water in a heating system. This includes air to water heat pumps and air conditioning systems. Air Source Heat Pumps (ASHPs) extract heat from the external air and condense this energy to heat a smaller space within a dwelling or non-domestic building. A pump circulates a refrigerant through a coil to absorb energy from the air. This refrigerant is then compressed to raise its temperature which can then be used for space heating and domestic hot water. They can feed either low-temperature radiators or underfloor heating and often have electric immersion heater back-up for the winter months.
Installation considerations	– ASHPs operate effectively in buildings with a low energy demand, as they emit low levels of energy suitable for maintaining rather than dramatically increasing internal temperatures. It is therefore vital that the dwelling has a low heating demand to ensure the system can provide appropriate space-heating capability. – Underfloor heating will give the best performance, but oversized radiators can also be used. – Immersion heater back-up required to ensure appropriate Domestic Hot Water (DHW) temperature in winter months. – Noise from the external unit can limit areas for installation. – £7,000-£11,000 per dwelling (taken from the Energy Saving Trust).
Advantages	– Air source systems are a good alternative solution to providing heating and hot water to well-insulated, low heat loss dwellings. – Running costs between heat pumps and modern gas boilers are comparable especially when Gas boilers require PV to achieve building regulation compliance.



Disadvantages	– Heat pumps are generally quiet to run, however if a collection of pumps were used, this could generate a noticeable hum while in operation. – Residents need to be made aware of the most efficient way of using a heat pump as the low flow rates used by such a system means that room temperature cannot be changed as reactively as a conventional gas or oil boiler system. – Will not perform well in homes that are left unoccupied and unheated for a long period of time. – Back-up immersion heating can drastically increase running costs. – Noise and aesthetic considerations limit installation opportunities.
Development feasibility ✓	– ASHPs are considered a viable option for this development scheme and shall be utilised as part of an individual heat pump strategy for dwellings. This works well with the reduced energy demand, as achieved through passive design principles. – This presents a zero carbon ready energy strategy for the development, as the national grid continues to decarbonise.

iv) Geothermal

Geothermal	The transfer of latent heat from the ground to a compressed refrigerant gas to warm the water in a heating system. This includes ground source heat pumps. Heat can be collected through the use of either horizontally laid or vertically installed coils. Ground Source Heat Pumps (GSHPs) operate on the same principle as an Air Source Heat Pump (ASHP) in that they extract heat from a source (in this instance the ground) and compress this energy to increase temperature for space heating and hot water. Pipework is installed into the ground, either through coils or in bore holes and piles, circulating a mix of water and antifreeze to extract energy from the ground, where the year-round temperature is relatively consistent (approx. 10 °C at 4 metres depth). This leads to a reliable source of heat for the building. Again, an electrically powered pump circulates the liquid and powers the compressor, however annual efficiencies for GSHPs tend to be higher than those of ASHPs.
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Installation considerations	– Require appropriate ground conditions to sink piles/bore holes or excavate for coils (which also require a large area of land.) – Decision between coils or piles can lead to significant extra cost. – Need to consider whether low temperature output is fed through underfloor heating (most efficient) or oversized radiators. – Similar to ASHPs, perform best in well-insulated buildings with a low heating demand. – Electric immersion heater required for winter use. – £11,000-£15,000 per dwelling dependent on the size of the system (taken from the Energy Saving Trust).
Advantages	– Perform well in well-insulated buildings, with limited heating demand. – More efficient than ASHPs.
Disadvantages	– The coils can be damaged by natural earthworks and by intensive gardening practices – occupants would need to be aware of the location of the coils for this system, and how to operate the system efficiently. Coils may also be damaged within the dwelling where the circuit is connected to the internal unit. – Will not perform well in buildings that are left unoccupied and unheated for a long period of time. – Back up immersion heating can drastically increase running costs. – Large area of ground needed for coil installation.
Development feasibility ✗	– GSHPs are not considered a viable option for this development scheme as they conflict with the preferred option of ASHP electric heating which works well with the reduced energy demand, as achieved through passive design principles.

v) Water Source Heat Pumps

Water Source Heat Pumps	The transfer of latent heat from a local water source to a compressed refrigerant gas to warm the water in a heating system. This includes water source heat pumps. Heat can be collected through the use of either horizontally laid or vertically installed coils. Water Source Heat Pumps (WSHPs) operate on the same principle as an Air Source Heat Pump (ASHP) in that they extract heat from a source (in this instance the water) and compress this energy to increase temperature for space heating and hot water. Pipework is installed into the water source, circulating a mix of water and antifreeze to extract energy from the water, where the year-round temperature is relatively consistent (approx. 10 °C below surface). This leads to a reliable source of heat for the building. Again, an electrically powered pump circulates the liquid and powers the compressor, however annual efficiencies for WSHPs tend to be higher than those of ASHPs.
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Installation considerations	– Require a reliable water source near to the site. – Need to consider affect on the water course. – Need to consider whether low temperature output is fed through underfloor heating (most efficient) or oversized radiators. – Similar to ASHPs, perform best in well-insulated buildings with a low heating demand. – Electric immersion heater required for winter use. – £11,000-£15,000 per dwelling dependent on the size of the system (taken from the Energy Saving Trust).
Advantages	– Perform well in well-insulated buildings, with limited heating demand. – More efficient than ASHPs.
Disadvantages	– The coils can be damaged by high water flow or low water levels– occupants would need to be aware of the location of the coils for this system, and how to operate the system efficiently. Coils may also be damaged within the dwelling where the circuit is connected to the internal unit. – Will not perform well in buildings that are left unoccupied and unheated for a long period of time. – Back up immersion heating can drastically increase running costs. – Large area of water needed for coil installation.
Development feasibility 	– WSHPs are not considered a viable option for this development scheme as they conflict with the preferred option of ASHP electric heating which works well with the reduced energy demand, as achieved through passive design principles.

vi) Biomass

Biomass	Providing a heating system fuelled by plant based materials such as wood, crops, or food waste. Biomass boilers generate heat for space heating and domestic hot water through the combustion of biofuels, such as woodchip, wood pellets or potentially biofuel or bio diesel. Biomass is considered to be virtually zero carbon. They can be used on an individual scale or for multiple dwellings as part of a district-heating network. A back-up heat source should be provided as consistent delivery of fuel is necessary for continued operation.
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Installation considerations	– Biomass boilers are larger than conventional gas-fired boilers and also require what can be significant storage space for the fuel source. This needs to be considered at planning stage to ensure an appropriate plant room can be provided. – Flue required to expel exhaust gases – design needs to be in line with the requirements of the Building Regulations. – Need to consider whether fuel deliveries will be reliable and consistent to the location of the site (especially relevant in rural areas) and whether the plant room can be easily accessed by the delivery vehicle. – £9,000-£21,000 per dwelling dependent on size (taken from Energy Saving Trust).
Advantages	– Considerable reduction in CO₂ emissions.
Disadvantages	– Limited reduction in running costs compared to A-rated gas boilers, but at a substantially higher up-front cost. – Plant room space required for boiler and storage. – Dependent on consistent delivery of fuel. – Ongoing maintenance costs (need to be cleaned regularly to remove ash.)
Development feasibility ✗	– Biomass is not considered a technically viable option for the development scheme. The primary reason for this is down to the development's location within the context of Wiltshire and the negative environmental impact of high levels of NO_x gases that are emitted from biomass boilers and the subsequent impact on local air quality. This is contrary to planning policies for air quality in England. – There are also concerns regarding a sustainable supply of biomass to the site. – The capital installation cost would be high which leads us to the conclusion that biomass would not be a commercially viable option for this development scheme.



APPENDIX 5: PART G CALCULATIONS

ENERGIST WATER EFFICIENCY CALCULATOR

Water efficiency calculator for 2 Bed Property , Land Rear of 117 High Street, Dilton Marsh , BA14 4DY

Our reference: RE.DM.BA13

Assessor: Dominique Stockford

Regulation: Part G (2015) Enhanced

Date issued: 7-1-2026, Revision: 0

This Compliance Checklist follows the methodology as listed in Appendix A of UK Building Regulations Approved Document AD G (2016). The targets comply with requirements of Part G (2015) Enhanced as used in England.

Table A1: The water efficiency calculator

Installation type	Unit of measure	Capacity / Flow rate	Use factor	Fixed use litres/person / day	Litres per person per day
WC (single flush)	Flush volume (litres)	0.0	4.42	0	0.00
WC (dual flush)	Full flush volume (litres)	4.0	1.46	0	5.84
	Part flush volume (litres)	2.6	2.96	0	7.70
WCs (multiple fittings)	Average effective flushing volume (litres)	0.0	4.42	0	0.00
Taps (excluding kitchen / utility room taps)	Flow rate (litres per minute)	6.1	1.58	1.58	11.29
Bath (where shower also present)	Capacity to overflow (litres)	155.0	0.11	0	17.05
Shower (where bath also present)	Flow rate (litres per minute)	8.0	4.37	0	34.96
Bath only	Capacity to overflow (litres)	0.0	0.50	0	0.00
Shower only	Flow rate (litres per minute)	0.0	5.60	0	0.00
Kitchen / utility room sink taps	Flow rate (litres per minute)	8.0	0.44	10.36	13.88
Washing machine	Litres/kg of dry load	8.2	2.10	0	17.16
Dishwasher	Litres/place setting	1.3	3.60	0	4.50
Waste disposal unit	Litres/use	0.0	3.08	0	0.00
Water softener	Litres/person/day	0.0	1.00	0	0.00
Total calculated use					112.37
Contribution from greywater (litres/person/day) from Table 4.6					0.00
Contribution from rainwater (litres/person/day) from Table 5.5					0.00
Normalisation factor					0.91
Total water consumption					102.26
External water use					5.00
Total water consumption (litres/person/day)					107.26
Maximum target					110.00