

Sustainability & Energy Statement

Allport House, Cowley Business Park, Uxbridge

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Executive Summary

This Statement has been prepared in support of a planning application for the construction of a two-storey extension onto the existing building at Allport House, Cowley Business Park, Cowley, Uxbridge to create nine, 2 and 3-bedroom apartments.

The Statement includes an energy demand assessment how selected energy efficiency, low-carbon and renewable energy technologies have been considered and those that have been incorporated into the scheme.

SAP calculations have been prepared for a representative sample of the new apartments, which have been based upon the construction specification set out within the report and the detailed planning drawings. The calculations provide an accurate assessment of the energy demand and carbon dioxide emissions arising from the new apartments and allow the testing of different technologies.

It is proposed to enhance the fabric insulation standards of the new apartments above the minimum required by the Building Regulations (Part L – 2013). The energy efficiency standards provide a 2.47% reduction in emissions before the incorporation of any renewable technologies. The proposal is of insufficient scale to efficiently provide a communal space heating and hot water system either with CHP or not and therefore the units will be provided with individual heating systems.

It is proposed to install air source hot water heat pumps (ASHPs) into all new apartments. These installations provide space heating and hot water from renewable technologies.

The reductions in carbon dioxide emissions can be summarised as follows:

	Carbon Emissions	% Reduction
	Kg CO ₂ per year	%
Baseline Emissions (TER)	16,839	
Actual Emissions using ASHPs (DER)	12,501	25.76%

The apartments achieve a water efficiency target of 105 litres per person per day.

The requirements of the planning policy are met.

1.0 Introduction

This report has been commissioned by Kingsbridge Assets LLP and provides a Sustainability and Energy Statement for the extension of the existing building known as Allport House, Cowley Business Park, Cowley, Uxbridge to create nine, 2 and 3-bedroom apartments.

The report describes the methodology used in assessing the development and the initiatives proposed.

The apartments have been designed and will be constructed to reduce energy demand and carbon dioxide emissions. The objective is to reduce the energy demand to an economic minimum by making investment in the parts of the construction that have the greatest impact on energy demand and are the most difficult and costly to change in the future, namely the building fabric. Once a cost effective structure has been designed, low-carbon and/or renewable technologies have been considered to provide heat and/or electricity to the new apartments.

The following hierarchy has been followed:

- Lean reduce demand and consumption
- Clean increase energy efficiency through the incorporation of low-carbon technologies
- Green provide renewable energy sources

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

2.0 Planning Policy Context

National Policy

The UK Government published its sustainable development strategy in 1999 entitled “A better quality of life: A strategy for sustainable development in the UK”. This sets out four main objectives for sustainable development in the UK:

- Social progress that recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high stable levels of economic growth and employment.

Sustainable Communities: Building for the Future, known colloquially as the Communities Plan was published in 2003. The Plan sets out a long-term programme of action for delivering sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in parts of the country, low demand in other parts and the quality of our public spaces. The Communities Plan describes sustainable communities as: Active, inclusive and safe, well run, environmentally sensitive, well designed and built, well connected, thriving, well served and fair for everyone.

The most relevant national planning policy guidance on sustainability is set out in:

- National Planning Policy Framework - 2019

Paragraph 148 states;

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

Regional and Local Policies

The Development Plan comprises the London Plan (2016) and the London Borough of Hillingdon Local Plan.

London Plan, published March 2016 – the following policies are relevant to the application:

Policy 5.2 - Minimising carbon dioxide emissions

- A Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:*
- 1 Be lean: use less energy*
 - 2 Be clean: supply energy efficiently*
 - 3 Be green: use renewable energy*
- D As a minimum, energy assessments should include the following details:*
- a calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy*
 - b proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services*
 - c proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)*
 - d proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.*

Policy 5.3 - Sustainable design and construction

- A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.*
- B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.*

Policy 5.15 – Water Use and Supplies

- B Development should minimise the use of mains water by:*
- a incorporating water saving measures and equipment*
 - b designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day*

Sustainable Design and Construction SPG – April 2014

The SPG provides Guidance on how schemes should comply with the London Plan and this Sustainability Statement has been prepared in accordance with the Guidance provided.

Hillingdon Local Plan: Part 1 Strategic Policies, adopted November 2012

Policy BE1: Built Environment

The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new development should:

- 10 *Maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants. The Council will require all new development to achieve reductions in carbon dioxide emission in line with the London Plan targets through energy efficient design and effective use of low and zero carbon technologies.*

Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. *Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.*
2. *Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.*
3. *Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.*
4. *Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.*
5. *Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.*
6. *Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.*
7. *Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals.*
8. *Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource.*
9. *Promoting new development to contribute to the upgrading of existing housing stock where appropriate.*

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

- 10. Locating and designing development to minimise the probability and impacts of flooding.*
- 11. Requiring major development proposals to consider the whole water cycle impact, which includes flood risk management, foul and surface water drainage and water consumption.*
- 12. Giving preference to development of previously developed land to avoid the loss of further green areas.*
- 13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks.*
- 14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.*

Local Plan: Part 2 Development Management Policies with modifications March 2019

Whilst not yet adopted the Part 2 Development Management Policies document is advanced and the emerging policies have been used in the preparation of this Statement. Of particular relevance to this application, which is not a 'major' application are the following policies;

Policy DMEI 2: Reducing Carbon Emissions

- A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets. **
- B) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.*

Policy DMEI 10: Water Management, Efficiency, and Quality

- G) All new development proposals (including refurbishments and conversions) will be required to include water efficiency measures, including the collection and reuse of rain water and grey water.*
- H) All new development should demonstrate water usage rates of no more than 105 litres/person/day.*
- J) All new development proposals will be required to demonstrate that there is sufficient capacity in the water and wastewater infrastructure network to support the proposed development. Where there is a capacity constraint the Local Planning Authority will require the developer to provide a detailed water and/or drainage strategy to inform what infrastructure is required, where, when and how it will be delivered.*

** London Plan Policy 5.2 sets emissions reduction targets of at least 35% on site for major development. Therefore the target does not apply for this application, which is for nine units.*

3.0 Assessment Methodology

The baseline energy demand and carbon dioxide emissions from the new apartments have been established by preparing SAP calculations for a representative unit. These have been based on Part L – 2013.

The calculations have been based upon certain assumptions as to the building specification and these are clarified below. These are not design calculations but serve to establish the environmental, technical and economic viability of various renewable and low carbon technologies. The baseline heating system for the assessment is mains gas.

Emission Factors

The CO₂ emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L (2013).

	kg CO ₂ /kWh
Natural Gas	0.216
Grid supplied and Displaced electricity	0.519

4.0 Proposal

The proposal is for the construction of a 2-storey extension to create nine, 2 and 3-bedroom apartments.

The accommodation schedule in detail is;

Unit Type	Number	Area	Total Area
		m ²	m ²
2-Bedroom duplex apartment	1	84.0	84.0
2-Bedroom duplex apartment	2	87.0	174.0
3-Bedroom duplex apartment	1	90.0	90.0
3-Bedroom duplex apartment	2	93.0	186.0
3-Bedroom apartment	1	95.0	95.0
3-Bedroom duplex apartment	2	97.0	194.0
Totals	9		823.0

5.0 Energy Efficiency

5.1 Demand Reduction (Be Clean)

Design

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

It is possible to exceed Building Regulations requirements (Part L - 2013) through demand reduction measures alone, which typically include a combination of passive design measures (e.g. building design and efficient building fabric) and active design measures (e.g. variable speed motors).

Passive Design Measures

The passive design measures proposed include;

Passive Solar Gain

Passive measures include allowing for natural ventilation and exposed thermal mass coupled with high levels of insulation, air tightness and the control of solar gain.

The arrangement of the apartments around a central terrace area allows the majority of units to benefit from dual aspects and there are four units with aspects towards the north and south, one unit with an aspect towards the west and south, one unit with an aspect towards the east and south, one unit with an aspect towards the west and north and one unit with an aspect towards the east and north.

There is one unit with a single aspect towards the south (Flat 32) and there are no units with a solely northerly aspect.

All units will benefit from direct sunlight at some point throughout the day.

Natural Daylighting

The orientation and the size of the windows have been optimised to maximise the amount of natural daylight and therefore reduce the demand for artificial lighting.

Efficient Building Fabric

Building Envelope

U-values of the building envelope must meet Building Regulations Part L (2013) standards and further improvements to U-values will reduce the building's heating requirements.

There is a commitment to exceed the minimum U-values required by the Building Regulations.

The construction suits the use of a lightweight frame and for the purposes of this assessment it is assumed the structure is built with 100mm light steel framing with 100mm insulation and clad externally with cladding including 75mm Kingspan or similar PIR insulation.

The sloping ceiling will be insulated with 120mm PIR insulation and any horizontal ceiling areas (lofts) will be insulated with 400mm mineral wool.

Windows will use low-e, argon filled double glazed units

It is proposed to set maximum limits for the elemental U-values as follows:

Element	Part L Limiting U-values	Proposed U-values	Proposed Improvement
	W/m ² K	W/m ² K	
Sloping Ceiling	0.20	0.15	25%
Dormer roofs, cheeks and low-level walls	0.20	0.15	25%
Roofs (lofts)	0.20	0.10	50%
External Walls	0.30	0.20	33%
Windows and external doors	2.00	1.40	30%

Air Leakage

Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration or air permeability) often through poor sealing of joints and openings in the building.

The Building Regulations set a minimum standard for air permeability of 10 m³ of air per hour per m² of envelope area, at 50Pa for new dwellings.

The apartments will seek to achieve a 50% improvement (on average) over the Part L requirement for the new apartments and will target a permeability of 5.0 m³/hr/m².

Thermal Bridging

Improving the U-values for the main building fabric without accurately addressing the thermal bridging of the various element will not achieve the fabric energy efficiency and CO₂ reduction targets set out in this strategy.

Accredited Construction Details (ACDs) have been developed to provide the performance standards required to achieve the higher energy efficiency requirements of the Building Regulations and it has been assumed the building will use the ACDs (or similar details) within the construction.

The bridging losses have been calculated using SAP Appendix K Table 1.

Ventilation

As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F was also revised in 2006 to address the possibility of overheating and poor air quality. It is assumed mechanical extract ventilation will be provided to all WCs, bathrooms and shower rooms.

Active Design Measures will include;

Efficient Lighting and Controls

Throughout the scheme natural lighting will be optimised.

Approved Document L1A requires three in four light fittings (75%) to be dedicated low energy fittings. The development will exceed this and all light fittings will be of a dedicated energy efficient type to all units.

External lighting will be fitted with time controls and light sensors to ensure illumination is restricted to required times. External lighting will be limited to a maximum fitting output of 150w.

Heating

The baseline SAPs for the apartments have been modelled on the basis of the space heating and hot water demand being met by individual gas condensing combination boilers although section 5.3 of this Statement considers other options.

5.2 Establishing Carbon Dioxide Emissions

Of the nine apartments proposed, eight are similar in design and scale and for the purposes of this assessment a SAP calculation has been prepared for a 3-bedroom duplex apartment of 93.0 m², which is proposed as representative of all units.

There is one 3-Bedroom apartment of 95.0 m², which is arranged over one floor but for the purposes of this assessment the emissions are assumed to be similar to the 2-storey units although in reality the emissions will be slightly less. This therefore assumes the worse case scenario.

The Building Regulation Compliance Reports are attached as Appendix 1 but the results can be summarised as follows:

3-Bedroom Duplex apartment – 93.0 m ² Flat 30	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg/m ² /yr
Space heating	6.04	6.37
Water heating	5.82	5.13
Electricity for pumps, fans and lighting	2.68	2.68
Total	14.54	14.18

The results above are aggregated across similar unit types to calculate the total site emissions;

	Area	CO ₂ TER	CO ₂ DER
	m ²	kg/yr	kg/yr
Single-floor apartment	95.0	1,381	1,347
Duplex apartments	728.0	10,585	10,323
Total		11,966	11,670

The reduction in the total CO₂ emissions of the new apartments as a result of the energy efficiency measures incorporated into the development are **296 kg CO₂ per year**, which equates to a reduction of **2.47%** of the TER emissions.

5.3 Low-Carbon and Renewable Technologies (Be Clean and Be Green)

This section determines the appropriateness of each low-carbon and renewable technology and considers the ability of that technology could assist the new apartments comply with the planning requirements.

The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

Wind

Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.

The Government wind speed database predicts local wind speeds at Cowley Business Park to be 4.8 m/s at 10m above ground level and 5.5 m/s at 25m above ground level. This is below the level generally required for commercial investment in large wind turbines. In addition the land take, potential for noise and signal interference make a large wind turbine unsuitable for this development.

Roof mounted turbines could be used at the development to generate small but valuable amounts of renewable electricity but the small output and contribution to total emissions means any investment would be small and purely tokenism. In addition the use of wind turbines will have a detrimental aesthetic impact on the appearance of the building.

Combined Heat and Power and Community Heating

Combined heat and power (CHP) also called co-generation is a de-centralised method of producing electricity from a fuel and 'capturing' the heat generated for use in buildings. The plant is essentially a small-scale electrical power station.

The production and transportation of electricity via the National Grid is very inefficient with over 65% of the energy produced at the power station being lost to the atmosphere and through transportation.

Consequently CHP can demonstrate significant CO₂ savings and although not necessary classed as renewable energy (depending on the fuel used) the technology is low carbon.

For a CHP plant to be economic it needs to operate for as much of the time as possible (usually deemed to be in excess of 14 hours per day) and therefore the size of the unit are usually based upon the hot water load of the building (s) with additional boilers meeting the peak space heating demand.

Community heating schemes are similarly communal systems but seek to supply heat only without the electricity production. Therefore, unless using a biomass or biofuel a community heating system will not demonstrate significant CO₂ reductions

The site is of insufficient scale and density to justify a communal heating system with CHP and the technology is therefore not appropriate.

Ground Source Heat Pumps

Sub soil temperatures are reasonably constant and predictable in the UK, providing a store of the sun's energy throughout the year. Below London the groundwater in the lower London aquifer is at a fairly constant temperature of 12° C. Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.

GSHP operates on a similar principle to refrigerators, transferring heat from a cool place to a warmer place. They operate most efficiently when providing space heating at a low temperature, typically via under floor heating or with low temperature radiators.

The use of ground source heat pumps can be very complicated for apartment buildings and because of the lack of accessible external space the installation of GSHPs is not viable and the technology is therefore not proposed.

Solar

(i) Solar Water Heating

Solar hot water panels use the sun's energy to directly heat water circulating through panels or pipes. The technology is simple and easily understood by purchasers.

Solar hot water heating panels are based generally around two types, which are available being 'flat plate collectors' and 'evacuated tubes'. Flat plate collectors can achieve an output of up to 1,124 kWh/annum (Schuco) and evacuated tubes can achieve outputs up to 1,365 kWh/annum (Riomay).

Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south. Evacuated tubes can be laid horizontally on flat roofs but flat plate collectors are recommended for installation at an incline of 30 degrees

The use of solar hot water heating panels to the apartments would require the installation of a hot water cylinder into each unit to act as a thermal store, which in turn would require the installation of a conventional gas boiler.

Flat plate solar hot water heating panels could be installed on the pitched roof of the building and could serve all nine apartments.

Assuming a reduction in the total hot water demand of 50% through the use of hot water heating panels the total reduction in the hot water demand from a solar hot water panel installation each dwelling is calculated as **9,773 kWh per year**. This equates to a reduction in emissions of 2,111 kg CO₂ per year, which when combined with the reduction in emissions from energy efficiency measures equates to a total reduction of **20.12%**.

The use of solar hot water panels is feasible but would require the use of conventional gas boilers and hot water cylinders.

(ii) Photovoltaics

Photovoltaic panels (PV) provide clean silent electricity. They generate electricity during most daylight conditions although they are most efficient when exposed to direct sunlight or are orientated to face plus or minus 30 degrees of due south.

PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices or architectural panels.

The electricity produced would provide power to the landlords supply with any unrequired electricity being distributed back to the Grid.

The installation of say **7 x 327W** panels would reduce emissions by 1,001 kg CO₂ per year, which when combined with the reduction from energy efficiency measures would equate to a total reduction of **10.84%**.

The use of photovoltaic panels is feasible and there are south orientated roof pitches available, which could accommodate a number of panels and would not detrimentally impact on the aesthetics of the proposal.

Air Source Heat Pumps (ASHP)

Air sourced heat pumps operate using the same reverse refrigeration cycle as ground source heat pumps, however the initial heat energy is extracted from the external air rather than the ground. These heat pumps can be reversed to provide cooling to an area although this reduces the coefficient of performance of the pumps.

ASHP tend to have a lower coefficient of performance (CoP) than GSHP but are considerably less costly to install.

Installing mains gas into apartment buildings can be complex and for the subject site would require a new installation into the existing building with the creation of the necessary infrastructure for gas risers, meters etc.

The preference would be to use an electrical system for space heating and hot water.

(i) Air Source Heat Pumps for Space Heating and Hot Water

Further SAP calculations have been prepared for the modelled units above but with the benefit of an air source heat pump installed to provide space heating through wet radiators and hot water.

The results from the calculations can be summarised as follows;

3-Bed Duplex apartment – 93.0 m ² Plot 30 With Air Source Heat Pump	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg/m ² /yr
Space heating	5.70	5.57
Water heating	5.78	7.36
Electricity for pumps, fans and lighting	2.68	2.26
Total	20.46*	15.19

* The individual emissions do not directly sum to the TER total because of the carbon factor apply to the individual figures.

The results above can be aggregated across similar unit types to calculate the total site emissions;

	Area	CO ₂ TER	CO ₂ DER
	m ²	kg/yr	kg/yr
Single-floor apartment	95.0	1,944	1,443
Duplex apartments	728.0	14,895	11,058
Total		16,839	12,501

The reduction in the total CO₂ emissions of the new apartments as a result of the energy efficiency measures and the installation of an air source heat pump into each unit are calculated as **4,338 kg CO₂ per year**, which equates to a reduction of **25.76%** of the TER emissions.

(ii) Air Source Heat Pump Hot Water Cylinders

An alternative to (i) is to install an air source heat pump hot water cylinder. The Dimplex Edel is a heat pump cylinder, which mounts a heat pump on top of a conventional hot water cylinder. The heat pump extracts heat from external air supplied to the unit via insulated ductwork to outside. As a result of the technology the cylinder consumes 5 times less electricity than a conventional electric water heater. The space heating to the apartments could be provided via slimline electric storage/ convector heaters using Select type controls for maximum efficiency.

Further SAP calculations have been prepared for the modelled units above but with the benefit of a Dimplex Edel air source hot water heat pump installed.

In order for the installation to achieve the requirements of the Building Regulations the SAP calculation includes the installation of 0.65 kW of photovoltaic panels.

The results from the calculations can be summarised as follows;

3-Bed Duplex apartment – 93.0 m ² Plot 30 With Air Source Hot Water Cylinder Heat Pump	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg/m ² /yr
Space heating	5.70	15.97
Water heating	5.78	5.30
Electricity for pumps, fans and lighting	2.68	2.26
Saving from Photovoltaic Panels	0.00	-3.13
Total	20.46*	20.40

* The individual emissions do not directly sum to the TER total because of the carbon factor apply to the individual figures.

The results above can be aggregated across similar unit types to calculate the total site emissions;

	Area	CO ₂ TER	CO ₂ DER
	m ²	kg/yr	kg/yr
Single-floor apartment	95.0	1,944	1,938
Duplex apartments	728.0	14,895	14,851
Total		16,839	16,789

The reduction in the total CO₂ emissions of the new apartments as a result of the energy efficiency measures and the installation of an air source hot water cylinder heat pump into each unit are calculated as **50 kg CO₂ per year**. This installation also includes 5.75 kW of photovoltaic panels. This could be achieved using 23 x 250W panels or 17 x 340W panels.

5.4 Summary of Calculations

The total maximum carbon dioxide emissions (TER) are calculated as 11,966 kg CO₂ per year with DER CO₂ emissions of 11,670 kg CO₂ per year based upon a baseline mains gas system.

Various technologies are considered above and whilst wind turbines, combined heat and power and ground source heat pumps are not considered appropriate the use of solar hot water heating panels, photovoltaic panels and air source heat pumps are considered feasible.

However, to avoid the necessity to install mains gas into the building it is proposed to install an electrical heating system to all units. This will provide space heating and hot water to the apartments.

Be Lean

The construction standards proposed include U-values, which demonstrate good practice and improve upon those required by the Building Regulations. Air tightness standards are targeted at a 50% improvement upon the minimum required by the Building Regulations.

The (carbon dioxide) emissions from the homes are reduced from the maximum by **296 kg CO₂ per year** as a result of the energy efficiency measures. This equates to a reduction of **2.47%**.

Be Green

It is proposed to install an air source heat pump into each apartment.

These installations reduce the total site carbon dioxide emissions by **4,338 kg CO₂ per year**, which equates to a reduction of **25.76%**. The Building Regulation Compliance Reports are attached as Appendix 2, which confirm the calculations.

The requirements of the planning policy are therefore met.

6.0 Climate change adaption and Water resources

Sustainable Drainage Systems (SUDS)

The Environment Agency flood maps show the site is within Flood Zone 1 and therefore of a low risk of flooding.

Surface Water Management

Consideration has been given to the use of grey water recycling. However, given the scale of development, the cost of the systems does not currently make them a viable option. They have therefore not been included in the proposals.

Water efficiency measures

In excess of 20% of the UK's water is used domestically with over 50% of this used for flushing WCs and washing (source: Environment Agency). The majority of this comes from drinking quality standard or potable water.

The water efficiency measures included in the apartments will ensure that the water use target of 105 litres per person per day is achieved.

Water efficient devices will be fully evaluated, and installed, wherever possible. The specification of such devices will be considered at detailed design stage and each will be subject to an evaluation based on technical performance, cost and market appeal, together with compliance with the water use regulations.

The following devices will be incorporated within the apartments:

- Water efficient taps.
- Water efficient toilets.
- Low output showers.
- Flow restrictors to manage water pressures to achieve optimum levels.
- Water meters with guidance on water consumption and savings.

Water consumption calculations have been carried out using the Water Efficiency Calculator provided by the BRE. Although not perfect this calculator gives a good indication of the probable water use in a dwelling, although this is largely dependent on the way on which occupants use their homes.

Below is a typical specification, which would achieve the 105 Litres per person per day target.

Schedule of Appliance Water Consumption		
Appliance	Flow rate or capacity	Total Litres
WC	4/2.6 litres dual flush	14.72
Basin	1.7 litres/min.	5.98
Shower	9.5 litres/min	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
Washing Machine	Default used	16.66
Dishwasher	Default used	3.90
		104.99

7.0 Materials and Waste

The BRE Green Guide to Specification is a simple guide for design professionals. The guide provides environmental impact, cost and replacement interval information for a wide range of commonly used building specifications over a notional 60-year building life. The construction specification will prioritise materials within ratings A+, A or B.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials to will have a zero ozone depleting potential

Construction waste

Targets will be set to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.

The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through appropriate selection of the construction method, good site management practices and spotting opportunities to avoid creating unnecessary waste.

The Construction Strategy will explore these issues, some of which are set out below:

- Proper handling and storage of all materials to avoid damage.
- Efficient purchasing arrangements to minimise over ordering.
- Segregation of construction waste to maximise potential for reuse/recycling.
- Suppliers who collect and reuse/recycle packaging materials.

Appendix 1 – Compliance Reports for Modelled Unit using Gas

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.3.11
Printed on 23 December 2019 at 09:12:07

Project Information:

Assessed By: ()

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 93m²

Site Reference : Allport House, Cowley Business Park

Plot Reference: Allport 3 Bed DUP 93 - GAS

Address :

Client Details:

Name: Kingsbridge

Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)

14.54 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.18 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

34.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE)

33.1 kWh/m²

OK

2 Fabric U-values

Element

Average

Highest

External wall

0.17 (max. 0.30)

0.20 (max. 0.70)

OK

Party wall

0.00 (max. 0.20)

-

OK

Floor

(no floor)

Roof

0.14 (max. 0.20)

0.15 (max. 0.35)

OK

Openings

1.40 (max. 2.00)

1.40 (max. 3.30)

OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

OK

4 Heating efficiency

Main Heating system:

Database: (rev 397, product index 016839):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant

Model: ecoTEC pro 28

Model qualifier: VUW GB 286/5-3

(Combi)

Efficiency 89.3 % SEDBUK2009

Minimum 88.0 %

OK

Secondary heating system:

None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.50 kWh/day	
	Permitted by DBSCG: 1.89 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Time and temperature zone control by device in database	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK
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Based on:

Overshading:	Average or unknown
Windows facing: South	5.04m ²
Windows facing: North	0.95m ²
Windows facing: North	1.26m ²
Windows facing: South	5.04m ²
Windows facing: North	1.89m ²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m ² K
Party Walls U-value	0 W/m ² K

Appendix 2 – Compliance Reports for Modelled Unit using an Air Source Heat Pump

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.3.11
Printed on 23 December 2019 at 11:26:10

Project Information:

Assessed By: ()

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 93m²

Site Reference : Allport House, Cowley Business Park

Plot Reference: Allport 3 Bed DUP 93 - ASHP

Address :

Client Details:

Name: Kingsbridge

Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity

Fuel factor: 1.47 (electricity)

Target Carbon Dioxide Emission Rate (TER)

20.46 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.19 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

34.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE)

33.1 kWh/m²

OK

2 Fabric U-values

Element

Average

Highest

External wall

0.17 (max. 0.30)

0.20 (max. 0.70)

OK

Party wall

0.00 (max. 0.20)

-

OK

Floor

(no floor)

Roof

0.14 (max. 0.20)

0.15 (max. 0.35)

OK

Openings

1.40 (max. 2.00)

1.40 (max. 3.30)

OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

OK

4 Heating efficiency

Main Heating system:

Database: (rev 397, product index 100051):

Heat pumps with radiators or underfloor heating - electric

Brand name:

Model:

Model qualifier:

()

Minimum 88.0 %

Secondary heating system:

None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.50 kWh/day	
	Permitted by DBSCG: 1.89 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Time and temperature zone control by device in database	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK
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Based on:

Overshading:	Average or unknown
Windows facing: South	5.04m ²
Windows facing: North	0.95m ²
Windows facing: North	1.26m ²
Windows facing: South	5.04m ²
Windows facing: North	1.89m ²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m ² K
Party Walls U-value	0 W/m ² K