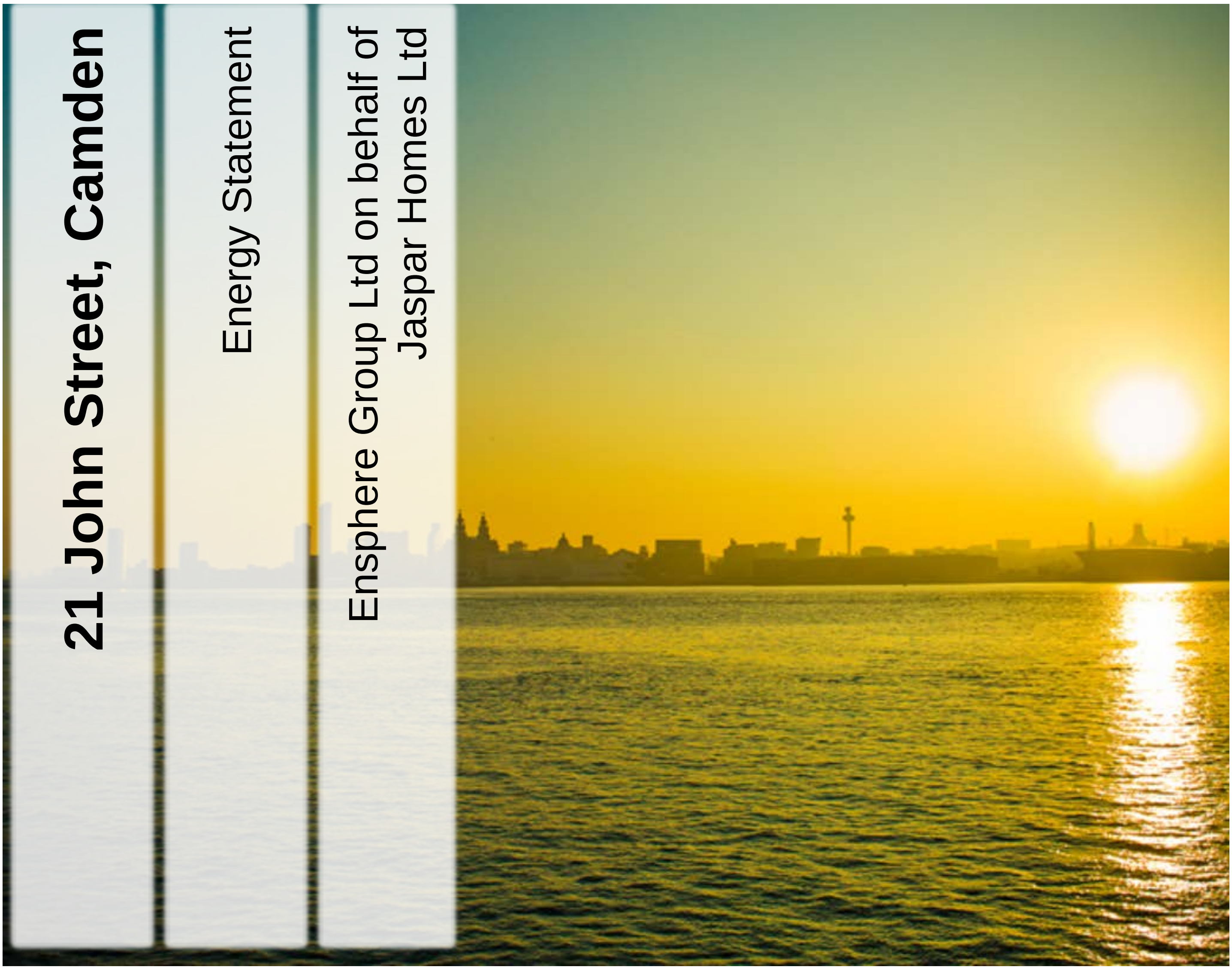

21 John Street, Camden

Energy Statement

Ensphere Group Ltd on behalf of
Jaspar Homes Ltd

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21 John Street, Camden

Energy Statement

Client Name:	Jaspar Homes Ltd
Document Reference:	18-E018-002
Project Number:	18-E018

Quality Assurance Approval Status

This document has been prepared and checked in accordance with Ensphere Group Ltd's Quality Management System.

Issue:	Version:	Prepared by:	Reviewed by:	Date:
Final	V2	Pete Jeavons	Pete Jeavons	March 2018

Contents

1. Executive Summary

1.1 This Energy Statement presents the energy strategy for a proposed scheme at 21 John Street, London, WC1N 2BF.

1.2 Development proposals include a roof extension for one residential unit.

1.3 Consideration has primarily been given to the planning policy context and other requirements prior to establishing a strategy based upon the energy hierarchy; with a priority given to energy reduction and efficiency. Renewable and low carbon technologies have also been considered in the context of their technical feasibility and financial viability.

1.4 The following is therefore proposed:

- High performance building fabric and energy efficient lighting, services and equipment;
- Passive design measures to reduce energy demand for heating, cooling, ventilation and lighting;
- Photovoltaics (PV) at roof level to offset the site's electricity demand.

1.5 Energy modelling has been undertaken using SAP; the results of which demonstrate that a carbon saving >20% below Part L 2013 is feasible with the above strategy.

1.6 Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework and policies of the Council and, when implemented, will provide an efficient and low carbon development.

2. Introduction

2.1 Ensphere Group Ltd was commissioned by Jaspar Homes Ltd to produce an Energy Statement for a proposed development at 21 John Street, London, WC1N 2BF.

Site & Surroundings

2.2 The Application Site is located the southern part of the London Borough of Camden. The site is of an irregular shape and currently occupied by a Grade II listed building comprising eight storeys of commercial and residential accommodation. The site also located in the Bloomsbury Conservation Area.

Proposed Development

2.3 Development proposals include a roof extension to accommodate one new, self-contained residential unit.

Report Objective

2.4 The objective of the Energy Statement is to outline how energy efficiency, low carbon and renewable technologies have been considered as part of the energy strategy.

3. Planning Policy Context

3.1 National and local planning policy relevant to sustainable development is considered in detail below:

National Planning Policy Framework

3.2 The Department for Communities and Local Government determines national policies on different aspects of planning and the rules that govern the operation of the system.

3.3 The transition to a low carbon economy is promoted in paragraphs 17, 93 through to 97 of the NPPF.

London Planning Policy Framework

3.1 The London Plan is the overall strategic plan for London. Chapter five of the Plan details London's Response to Climate Change.

Local Planning Policy Framework

Camden Local Plan (June 2017)

3.2 The Local Plan was adopted by Council on 3 July 2017 and has replaced the Core Strategy and Camden Development Policies documents as the basis for planning decisions and future development in the borough. Policies relevant to this report are presented below:

Policy CC1 Climate Change Mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. Promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. Require all major development to demonstrate how London Plan targets for carbon dioxide have been met;

c. Ensure that the location of the development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. Support and encourage sensitive energy efficiency improvements to existing buildings;

e. Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. Expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. Working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. Protecting existing decentralised energy networks (e.g. at Gower Street Bloomsbury, Kings Cross, Gospel Oak, and Somers Town) and safeguarding potential network routes; and

i. Requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

4. Other Planning Considerations

4.1 This section comprises an overview of other considerations relevant to the Energy Statement.

National Planning Practice Guidance

Climate Change

4.2 Advises how planning can identify suitable mitigation and adaption measures in plan-making and the application process to address the potential for climate change.

Renewable and Low Carbon Energy

4.3 The guidance is intended to assist local councils in developing policies for renewable energy in local plans, and identifies the planning considerations for a range of renewable sources.

London Planning Practice Guidance

Sustainable Design and Construction Supplementary Planning Guidance (April 2014)

4.4 The Mayor has published supplementary planning guidance on Sustainable Design and Construction. The document provides guidance on the implementation of London Plan policy 5.3 as well as a range of policies, primarily in Chapters 5 and 7 that deal with matters relating to environmental sustainability.

Energy Planning Guidance (March 2016)

4.5 Policy 5.2 of the London Plan requires each major development proposal to submit a detailed energy assessment. The GLA provides guidance to developers and their advisors on preparing energy assessments to accompany strategic planning applications. With regards to the carbon reduction targets detailed in policy 5.2 of the London Plan, the mayor will apply a 35 per cent target beyond Part L 2013 of the Building Regulations. This is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010.

Local Planning Policy Guidance

Camden Planning Guidance – Sustainability (CPG3) (2015)

4.6 The guidance provides information on ways to achieve carbon reductions and more sustainable developments. It highlights the Council's requirements and guidelines in support of policies CS13, DP22 and DP23. The Guidance confirms that whilst the Code for Sustainable Homes has been withdrawn, the Council would still require new residential dwellings to demonstrate a 20% reduction in on-site carbon dioxide emissions (equivalent to a Code Level 4 performance).

4.7 The guidance also includes reference to a 20% renewables target contained within the, now superseded, Core Strategy. Given that this policy is no longer current, this target is not considered to apply.

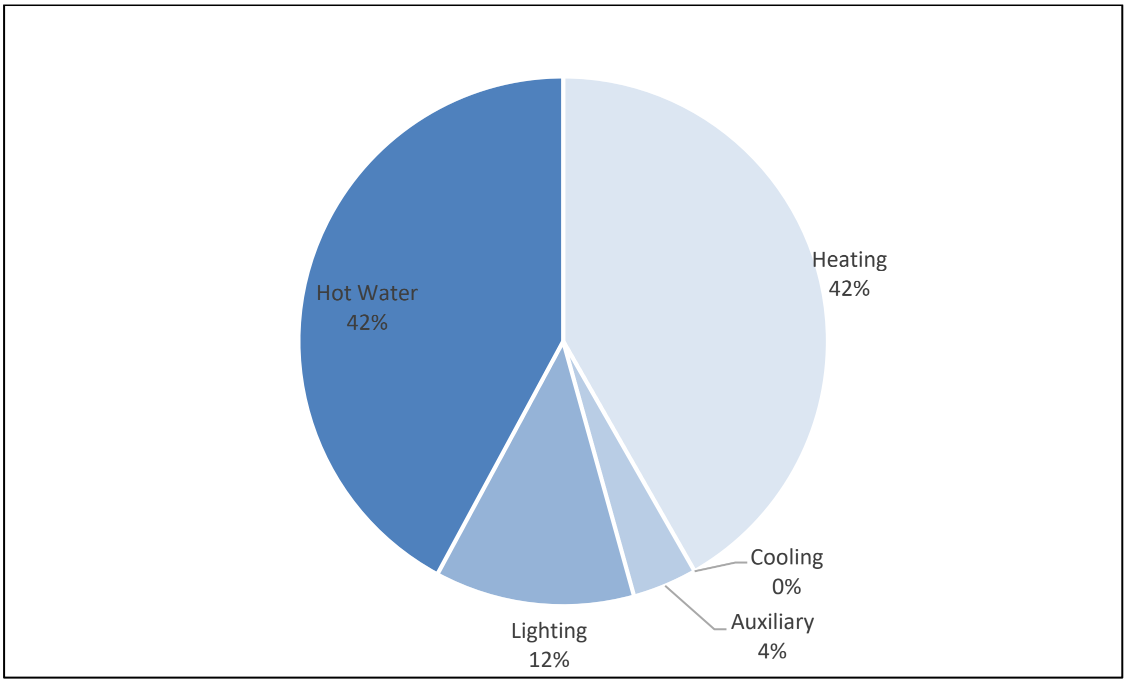
5. Baseline & Carbon Reduction Target

Baseline Position

5.1 A baseline position has been established and calculated using SAP and assuming compliance with Part L of the 2013 Building Regulations.

5.2 The following represents site-wide data for the residential TER calculation.

Figure 5.1 Baseline Carbon Emissions (Residential)



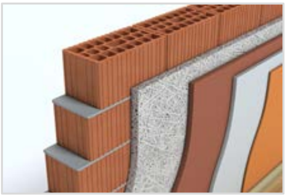
Carbon Reduction Target

5.3 The Target Emission Rate for the development is calculated at 19.71kgCO_2/m^2/year; meaning that a 20% reduction in carbon emission would require an emission rate less than 15.71kgCO_2/m^2/year.

6. Passive Design & Energy Efficiency

6.1 This section considers features of the proposed design (including indicative performance levels) relevant to passive design and energy efficiencies.

Table 6.1 Passive Design & Energy Efficiency Design Features

Aspect	Description	Appraisal
Passive Design 	Passive design seeks to maximize the use of natural sources of heating, cooling and ventilation to maintain thermal comfort levels within the building.	Passive Heating / Cooling It is intended that windows will be set back slightly to provide a degree of shading from the sun. It is intended that the building will have the potential to be naturally ventilated (via openable window / vent), with ventilation rates calculated to ensure sufficient air chances per hour to maintain temperatures within a comfortable range. Lighting and Daylighting Design The design of the glazed areas will seek to offer good access to natural daylight to reduce consumption of energy for artificial lighting. Overall, a balance shall be sought between achieving daylighting levels and winter solar gains, whilst minimising summer heat gains and cooling loads.
Fabric Efficiency 	Fabric efficiency concerns the thermal properties associated with the building fabric and construction.	Insulation Heat Transfer Coefficients, otherwise referred to as U-Values, are a measure of the rate of heat transfer through a building element over a given area, under standardised conditions (i.e. the rate at which heat is lost or gained through a fabric). It is intended that the performance of the building fabric will incorporate relatively low U-Values to reduce the rate at which the buildings lose heat, preserving the heat within the space and reducing the requirement for mechanical heating. The following U-values are provided as a guide for the basic building elements: External Walls ~0.18W/m^{2}K;

		Roof ≤0.13W/m^{2}K; Windows ≤1.40W/m^{2}K. <u>Air Tightness</u> A high level of air tightness is proposed and a level below 5m^3/h/m^2 is targeted, meaning that air infiltration between the internal and the external environment will be largely controlled and space heating demand further reduced. <u>Thermal Bridging</u> Thermal bridging is the penetration of the insulation layer by a highly conductive non-insulating material allowing rapid heat transfer from an interior to exterior environment (and vice versa). In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges. The building fabric shall be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements.
System Efficiency 	System efficiency concerns the energy efficiency of the heating, cooling, lighting and auxiliary systems employed within the building.	<u>Extract Fans</u> It is anticipated that extract fans will be employed in WC and kitchen areas. The specific fan power (SFP) for these systems will be efficient and below 0.3W/l/s. <u>Metering</u> The major energy uses shall be monitored via separate energy meters and a Building Energy Management System (BEMS) will be installed, which will allow for optimum operational control and performance of complex building services in the development. <u>Lighting Efficacy</u> At this stage, detailed lighting design calculations have not yet been undertaken, but lighting design is intended to be highly efficient and in excess of Building Standards requirements. It is intended that lighting efficacy shall be in excess of 80 lumens/circuit Watt.

		Lighting controls (e.g. PIR occupancy sensors) shall be employed throughout the non-residential components and zoned to suit the different space uses; the lighting control strategy shall work in conjunction with daylighting sensors in spaces with substantial glazing, to further reduce the energy consumption for artificial lighting. External lighting shall be highly efficient and employ controls to avoid energy wastage from unnecessary operation during daytime.
Overheating Mitigation 	The issue of overheating will need detailed and considered assessment at a later stage of design on the basis that, as buildings become progressively better sealed and insulated, the potential for overheating increases.	<u>Limiting Summer External Gains</u> Solar control glazing shall be installed to the elevations most affected; the precise specification of glazing types for windows and glazed curtain walling is to be based upon further analysis at later stages so that the appropriate balance is found between limiting summer heat gains without compromising daylight harvesting and winter solar gains. Thermal mass (discussed above) and internal occupant-controlled shading elements will be considered at the more detailed design stage along with heat reflective finishes of the external building surfaces. The above shall be considered in conjunction and interrelationship with the ventilation strategy, to ensure thermal comfort for occupants and energy savings. <u>Limiting Internal Heat Gains</u> Heat losses from the Hot Water and Low Temperature Hot Water (LTHW) distribution network are considered to be a significant source of potential overheating in well insulated buildings. This issue can be a significant factor affecting comfort and will therefore need full consideration during the detailed design of the mechanical systems. However, it is expected that attention will be given to: • The positioning of the distribution network and its potential impact on surrounding spaces; • The (mechanical) ventilation of spaces where heating pipework is distributed (e.g. corridors); • The implementation of combined passive/active ventilation systems for air exhaust of spaces into corridors and to the outside; • Maximising the natural ventilation potential of spaces;

		• The performance of the insulation, with calculations undertaken assessing heat losses from the pipework relative to the heat losses from the spaces.

7. District Energy & Low Carbon Technology Appraisal

7.1 Low carbon technologies are energy generation systems which offer the capability to make more efficient and effective use of primary energy resources, emitting significantly lower levels of carbon dioxide than conventional energy generation methods.

Table 7.1 District Energy & Low Carbon Technology Appraisal

Technology	Description	Appraisal	Proposed
District Energy 	The term "district energy" applies to the energy distribution network, rather than the origins of the energy and the extent of any carbon savings will be largely determined by the energy source and heat losses on the network.	<u>Opportunities</u> • A sufficient heating demand exists on site which could be satisfied by a District Energy system; <u>Limitations</u> • Connection costs and energy prices may be high; • The carbon factor associated with the fuel source is beyond the control of the developer. • There is no district energy network (DEN) in the vicinity of the site. <u>Appraisal</u> • Connection to DEN is not proposed on the basis that no network exists in the vicinity of the site. Furthermore, the scale and nature of the development do not support the creation of an onsite network as heat losses would be disproportionately large.	No
Combined Heat & Power 	Combined Heat & Power (CHP) systems generate electrical energy and provide the waste heat from the process to be used on site. They are typically gas-powered but can be run off alternative fuel sources. CHP is a highly	<u>Opportunities</u> • A sufficient heating demand exists on site which the CHP system could supply; • A base load exists for hot water generation for the residential elements of the proposal. <u>Limitations</u> • The space heating demand presents a variable daily, weekly and seasonal trend; this potentially introduces design complexity and viability implications for the technology;	No

	efficient means to supply heat in developments, providing significant carbon savings and wider environmental benefits (the power generation is much less resource intensive and carbon emitting compared to grid electricity from the average UK power station).	• The development is of low density. Appraisal • CHP is not considered a viable technology for the site on the basis of the scale and nature of development and energy demand profile.	

8. Renewable Technology Appraisal

8.1 Renewable technologies are those which take their energy from sources which are considered to be inexhaustible (e.g. sunlight, wind etc.). Emissions associated with renewables are generally considered to be negligible and the technologies are frequently referred to as “zero carbon”.

Table 8.1 Renewable Technology Appraisal

Technology	Description	Appraisal	Proposed
Biomass Systems 	Biomass systems are heating systems that use agricultural, forest, urban and industrial residues and waste to produce heat and (depending on the system) electricity. At the building scale, biomass boilers using wood pellets or woodchips are the norm. Biomass should be sourced locally to limit “embodied carbon” associated with transport and ideally be derived from waste wood products to limit the take-up of agricultural land for fuel crops.	Opportunities • A sufficient heating demand exists, which the biomass system could supply; Limitations • Transport, storage and maintenance requirements, would increase the managerial requirements of operation; • Carbon emissions associated with cultivation, processing and transport of biomass are not normally considered in the context of planning or Building Regulations meaning that total carbon emissions are likely to be significantly higher than estimated. Appraisal • Whilst technically feasible, the use of biomass would increase the transport in the vicinity of the site and would have a detrimental effect on local air quality. • Biomass is therefore not a preferred technology for the scheme.	No

<table>
<tr>
<td>Heat Pumps

<u>Air Source Heat Pumps</u>

</td>
<td rowspan="2">Heat pumps draw thermal energy from the air, water or ground (“source”) and upgrade it to be used as useful heat at another location (“sink”). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the “sink”.

Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun.

Reversible systems can provide air conditioning comfort cooling; however, when in cooling mode, the system is not considered renewable as it is not taking advantage of a renewable source of energy.</td>
<td><u>Opportunities</u>
• A sufficient heating demand exists, which ASHPs could accommodate;

<u>Limitations</u>
• The performance of ASHPs typically varies more than other heat pump options due to greater fluctuations in air temperatures, relative to other heat sources;

• Performance reduces when systems are required to achieve higher temperatures. Heat pumps are therefore normally better applied to space heating rather than hot water and specifically to low supply temperature systems (e.g. underfloor heating);

• All heat pumps generate noise associated with the movement of refrigerant and (any) fans;

• Whilst less expensive than other heat pump systems, relative to other technologies, capital and maintenance costs are high;

<u>Appraisal</u>
• ASHPs are not proposed on the basis that a less complicated renewable solution is preferred.</td>
<td>No</td>
</tr>
<tr>
<td><u>Ground Source Heat Pumps</u>

</td>
<td><u>Opportunities</u>
• A sufficient heating demand exists, which GSHPs could accommodate;

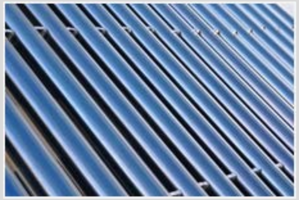
<u>Limitations</u>
• Site constraints and shading render a horizontal configuration non-feasible. Capital costs for vertical installations are typically greater than for horizontal systems due to drilling costs;

• Thermal properties of the ground will depend upon a number of factors including geology and depth. Desktop information suggests that thermal properties are below average and therefore deeper boreholes would likely be required;

• Performance reduces when systems are required to achieve higher temperatures. Heat pumps are therefore normally better applied to space heating rather than hot water and specifically to low supply temperature systems (e.g. underfloor heating);</td>
<td>No</td>
</tr>
</table>

		Appraisal • Installed vertically, a GSHP system would be technically feasible for supplying heat to part of the development; • However, uncertainties exist with regards to the thermal properties of the ground and performance; • GSHPs are not proposed; principally for financial viability reasons and on the basis that it would represent a relatively expensive means of reducing carbon.	
Water Source Heat Pumps 		Opportunities • A sufficient heating demand exists, which WSHPs could accommodate; Limitations • Surface water course in close proximity to the site are considered of insufficient size to apply this technology. • Any use of the river would need to be considerate of the relevant authorities, other users and potential for impact on wildlife. Appraisal • WSHP is not considered an option for the site; primarily for technical feasibility considerations.	No
Micro Hydro Power 	Micro hydro power systems harnesses energy from flowing water by using height differences (called "head"); the minimum allowable head is 1.5m and ideally not lower than 10m.	Opportunities • A sufficient electricity demand exists, which micro hydro power could address. Limitations • No suitable water body is found in the vicinity of the site. Appraisal • Micro hydro is therefore not considered an option for the site, for technical feasibility reasons.	No

Micro Wind Power 	Wind turbines are used to generate electricity; with power production determined by the rotation of the blades and being proportionate to the speed of their rotation. The technology is most efficient for constant, low turbulence wind profiles.	<u>Opportunities</u> • A sufficient electricity demand exists, which micro wind power could contribute towards; <u>Limitations</u> • The local wind profile is expected to be highly turbulent, reducing the efficiency of the system; • The average wind speed is low and falls within the lower range for a viability case; • Roof mounted turbines would add height to the buildings with associated aesthetic and planning considerations; and • Moving plant on the roof potentially creates noise and vibration, with associated nuisance and structural considerations. <u>Appraisal</u> • Whilst wind turbines are considered technically feasible in a limited capacity, wind speeds are relatively low and subject to turbulence. The technology is therefore likely to underperform; • Given the uncertainty over performance, the fact that any contribution will likely be quite minor, micro wind turbines are not proposed for the development.	No
Solar Systems <u>Photovoltaics</u> 	Both solar thermal and photovoltaic (PV) systems convert energy from the sun into a form which can be applied within the building. Solar thermal generates energy for heating (usually for hot water) and PV generates electricity. Hybrid photovoltaic / solar thermal collectors are	<u>Opportunities</u> • A sufficient electricity demand exists; which PV could partially address; • An extent of roof space exists on the site, which is not subject to significant overshading. <u>Limitations</u> • The area of roof space will limit the potential application of the technology; • The technology tends to have a high capital cost per unit of carbon saved.	Yes

	also available and co-generate heat and power. To maximise the performance from the technology, the solar collectors should be pointed towards the sun; which in the UK is maximised when orientated to the south and at an angle of 30º.	Appraisal • PV panels are proposed in combination with other technologies in order to offset the requirement for grid electricity.	
PV-T 		Opportunities • A sufficient electricity and heating demand exists; which PV-T could partially address; • An extent of roof space exists on the site, which is flat and not subject to significant overshading. Limitations • Potential carbon savings are jeopardised by auxiliary power needed to move the heat around the development; • Heating energy generation presents high seasonal variance and has therefore limited scope in efficiently supplying the base heating load (hot water); Appraisal • Whilst technically feasible in a limited capacity, the potential maximum application of the technology is unlikely to provide significant carbon dioxide reductions for the development; • This technology would conflict with other preferred LZC technologies; • PV-T panels are therefore not a preferred option for the energy strategy.	No
Solar Thermal 		Opportunities • A sufficient heating demand exists; which Solar Thermal could partially address; • An extent of roof space exists on the site, which is flat and not subject to significant overshading.	No

		Limitations • The technology tends to have a high capital cost per unit of carbon saved; • Heating energy generation presents high seasonal variance and has therefore limited scope in efficiently supplying the base heating load (hot water); Appraisal • Whilst technically feasible in a limited capacity, the potential maximum application of the technology is unlikely to provide significant carbon dioxide reductions for the development; • This technology would conflict with other preferred LZC technologies; • Solar Thermal panels are therefore not a preferred option for the energy strategy.	

9. Summary

9.1 This Energy Statement provides an overview of the energy strategy in consideration of the site context, anticipated energy requirements and local priorities and initiatives.

9.2 A review of Camden Council's planning policies has identified a number of requirements relating to energy. Of these, Local Plan policy CC1 (*Climate Change Mitigation*) is considered most pertinent along with Camden Planning Guidance – *Sustainability* (CPG3). Consideration has also been given to the NPPF and GLA's London Plan and the targets contained therein.

9.3 The approach follows the Energy Hierarchy, with priority given to efficient design on the basis that it is preferable to reduce carbon emissions by reducing energy demand than through the use of low and/or zero carbon technologies.

9.4 The building's fabric shall be constructed to a high performance standard, achieving high levels of thermal insulation and low air permeability. Energy efficient lighting and appropriate controls shall be employed throughout the development.

9.5 It is proposed to install an extent of photovoltaics (PV) at roof level; which would assist in reducing carbon emissions by 20% relative to Part L 2013. Indicative energy modelling has been undertaken using SAP and results are appended to this report demonstrating this level of performance.

9.6 Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework and policies of the Council and, when implemented, will provide an efficient and low carbon development.

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Appendices

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A. Site Plan

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Middlesex HA7 4AR

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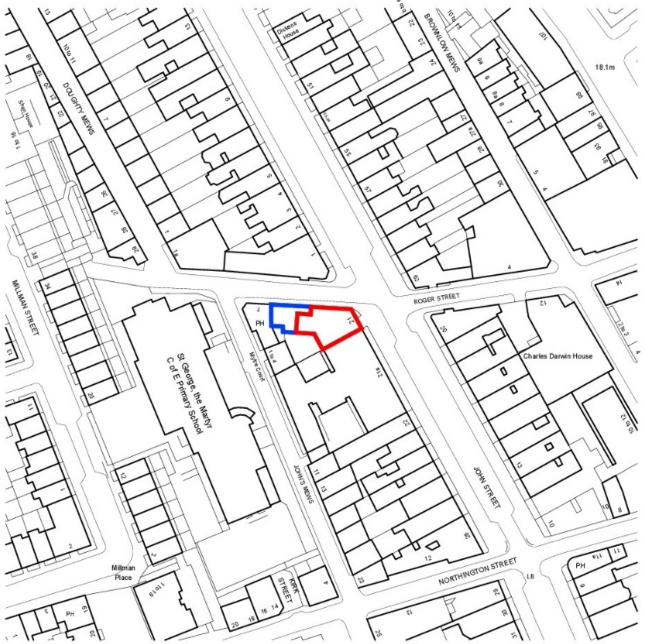

1 SITE LOCATION PLAN
1:1250 @ A3

Rev	Description	Date

PROJECT:
21 John Street,
Holborn, London
WC1N 2BP

DRAWING:
Site Location Plan

DWN:	CKD:	DATE:	STATUS:
DS	-	15/08/17	PLANNING

SCALE:	DWG NO:	REV:
1:1250 @ A3	JM033_PL_0001	00

B. Energy Modelling Outputs

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DER WorkSheet: New dwelling design stage

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User Details:

Assessor Name:
Stroma Number:
Software Name: Stroma FSAP 2012
Software Version: Version: 1.0.4.10

Property Address: Plot 1 Top floor

Address : 21 John Street, London

1. Overall dwelling dimensions:

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground floor	50	(1a) x	2.5	(2a) =	125	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	125	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.23	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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DER WorkSheet: New dwelling design stage

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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m^2)	Openings m^2	Net Area A ,m^2	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.2	x1/[1/(1.4)+ 0.04] =	1.59			(27)
Windows Type 2			2.62	x1/[1/(1.4)+ 0.04] =	3.47			(27)
Windows Type 3			1.2	x1/[1/(1.4)+ 0.04] =	1.59			(27)
Windows Type 4			0.6	x1/[1/(1.4)+ 0.04] =	0.8			(27)
Windows Type 5			1.2	x1/[1/(1.4)+ 0.04] =	1.59			(27)
Windows Type 6			0.6	x1/[1/(1.4)+ 0.04] =	0.8			(27)
Windows Type 7			0.94	x1/[1/(1.4)+ 0.04] =	1.25			(27)
Walls	59	11.96	47.04	x 0.18 =	8.47			(29)
Roof	50	0	50	x 0.13 =	6.5			(30)
Total area of elements, m²			109					(31)

* *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
** *include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)…(30) + (32) =	30.82	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	3742.8	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		4.36	(36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss	(33) + (36) =	35.18	(37)
Ventilation heat loss calculated monthly	(38)m = 0.33 × (25)m x (5)		

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(38)m=	22.42	22.35	22.28	21.96	21.9	21.62	21.62	21.57	21.73	21.9	22.02	22.15	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(39)m=	57.6	57.53	57.46	57.14	57.08	56.8	56.8	56.75	56.91	57.08	57.2	57.33	

Average = Sum(39)1…12 /12= 57.14 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.15	1.15	1.15	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.15	

Average = Sum(40)1…12 /12= 1.14 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.69 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 74.34 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77	

Total = Sum(44)1…12 = 892.08 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44	

Total = Sum(45)1…12 = 1169.66 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)		
Water storage loss:		
a) If manufacturer's declared loss factor is known (kWh/day):	0	(48)
Temperature factor from Table 2b	0	(49)
Energy lost from water storage, kWh/year (48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
If community heating see section 4.3		
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

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Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(61)m=	41.67	36.27	38.64	35.93	35.61	32.99	34.09	35.61	35.93	38.64	38.86	41.67	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(62)m=	162.94	142.33	148.09	131.35	127.17	112	107.31	119.62	120.94	137.72	147.01	159.11	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(64)m=	162.94	142.33	148.09	131.35	127.17	112	107.31	119.62	120.94	137.72	147.01	159.11	

Output from water heater (annual)1…12 — 1615.57 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(65)m=	50.74	44.33	46.05	40.71	39.34	34.52	32.87	36.84	37.25	42.6	45.67	49.47	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	13.13	11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.84	12.66	13.49	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	147.23	148.76	144.91	136.72	126.37	116.64	110.15	108.62	112.47	120.67	131.01	140.74	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	(71)
Water heating gains (Table 5)													
(72)m=	68.2	65.97	61.9	56.54	52.88	47.94	44.17	49.51	51.73	57.26	63.44	66.49	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	276.91	274.74	264.64	248.78	232.97	217.47	207.57	212.84	221.1	237.12	255.46	269.07	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	1.2	x	11.28	x	0.63	x	0.7	=	16.55	(75)
Northeast	0.9x	0.77	x	0.6	x	11.28	x	0.63	x	0.7	=	2.07	(75)

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Northeast	0.9x	0.77	x	1.2	x	22.97	x	0.63	x	0.7	=	33.69	(75)
Northeast	0.9x	0.77	x	0.6	x	22.97	x	0.63	x	0.7	=	4.21	(75)
Northeast	0.9x	0.77	x	1.2	x	41.38	x	0.63	x	0.7	=	60.7	(75)
Northeast	0.9x	0.77	x	0.6	x	41.38	x	0.63	x	0.7	=	7.59	(75)
Northeast	0.9x	0.77	x	1.2	x	67.96	x	0.63	x	0.7	=	99.69	(75)
Northeast	0.9x	0.77	x	0.6	x	67.96	x	0.63	x	0.7	=	12.46	(75)
Northeast	0.9x	0.77	x	1.2	x	91.35	x	0.63	x	0.7	=	134	(75)
Northeast	0.9x	0.77	x	0.6	x	91.35	x	0.63	x	0.7	=	16.75	(75)
Northeast	0.9x	0.77	x	1.2	x	97.38	x	0.63	x	0.7	=	142.86	(75)
Northeast	0.9x	0.77	x	0.6	x	97.38	x	0.63	x	0.7	=	17.86	(75)
Northeast	0.9x	0.77	x	1.2	x	91.1	x	0.63	x	0.7	=	133.64	(75)
Northeast	0.9x	0.77	x	0.6	x	91.1	x	0.63	x	0.7	=	16.71	(75)
Northeast	0.9x	0.77	x	1.2	x	72.63	x	0.63	x	0.7	=	106.54	(75)
Northeast	0.9x	0.77	x	0.6	x	72.63	x	0.63	x	0.7	=	13.32	(75)
Northeast	0.9x	0.77	x	1.2	x	50.42	x	0.63	x	0.7	=	73.96	(75)
Northeast	0.9x	0.77	x	0.6	x	50.42	x	0.63	x	0.7	=	9.25	(75)
Northeast	0.9x	0.77	x	1.2	x	28.07	x	0.63	x	0.7	=	41.17	(75)
Northeast	0.9x	0.77	x	0.6	x	28.07	x	0.63	x	0.7	=	5.15	(75)
Northeast	0.9x	0.77	x	1.2	x	14.2	x	0.63	x	0.7	=	20.83	(75)
Northeast	0.9x	0.77	x	0.6	x	14.2	x	0.63	x	0.7	=	2.6	(75)
Northeast	0.9x	0.77	x	1.2	x	9.21	x	0.63	x	0.7	=	13.52	(75)
Northeast	0.9x	0.77	x	0.6	x	9.21	x	0.63	x	0.7	=	1.69	(75)
Southeast	0.9x	0.77	x	1.2	x	36.79	x	0.63	x	0.7	=	13.49	(77)
Southeast	0.9x	0.77	x	0.94	x	36.79	x	0.63	x	0.7	=	10.57	(77)
Southeast	0.9x	0.77	x	1.2	x	62.67	x	0.63	x	0.7	=	22.98	(77)
Southeast	0.9x	0.77	x	0.94	x	62.67	x	0.63	x	0.7	=	18	(77)
Southeast	0.9x	0.77	x	1.2	x	85.75	x	0.63	x	0.7	=	31.45	(77)
Southeast	0.9x	0.77	x	0.94	x	85.75	x	0.63	x	0.7	=	24.63	(77)
Southeast	0.9x	0.77	x	1.2	x	106.25	x	0.63	x	0.7	=	38.97	(77)
Southeast	0.9x	0.77	x	0.94	x	106.25	x	0.63	x	0.7	=	30.52	(77)
Southeast	0.9x	0.77	x	1.2	x	119.01	x	0.63	x	0.7	=	43.65	(77)
Southeast	0.9x	0.77	x	0.94	x	119.01	x	0.63	x	0.7	=	34.19	(77)
Southeast	0.9x	0.77	x	1.2	x	118.15	x	0.63	x	0.7	=	43.33	(77)
Southeast	0.9x	0.77	x	0.94	x	118.15	x	0.63	x	0.7	=	33.94	(77)
Southeast	0.9x	0.77	x	1.2	x	113.91	x	0.63	x	0.7	=	41.77	(77)
Southeast	0.9x	0.77	x	0.94	x	113.91	x	0.63	x	0.7	=	32.72	(77)
Southeast	0.9x	0.77	x	1.2	x	104.39	x	0.63	x	0.7	=	38.28	(77)
Southeast	0.9x	0.77	x	0.94	x	104.39	x	0.63	x	0.7	=	29.99	(77)
Southeast	0.9x	0.77	x	1.2	x	92.85	x	0.63	x	0.7	=	34.05	(77)
Southeast	0.9x	0.77	x	0.94	x	92.85	x	0.63	x	0.7	=	26.67	(77)
Southeast	0.9x	0.77	x	1.2	x	69.27	x	0.63	x	0.7	=	25.4	(77)

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Southeast	0.9x	0.77	x	0.94	x	69.27	x	0.63	x	0.7	=	19.9	(77)
Southeast	0.9x	0.77	x	1.2	x	44.07	x	0.63	x	0.7	=	16.16	(77)
Southeast	0.9x	0.77	x	0.94	x	44.07	x	0.63	x	0.7	=	12.66	(77)
Southeast	0.9x	0.77	x	1.2	x	31.49	x	0.63	x	0.7	=	11.55	(77)
Southeast	0.9x	0.77	x	0.94	x	31.49	x	0.63	x	0.7	=	9.05	(77)
West	0.9x	0.77	x	1.2	x	19.64	x	0.63	x	0.7	=	7.2	(80)
West	0.9x	0.77	x	0.6	x	19.64	x	0.63	x	0.7	=	3.6	(80)
West	0.9x	0.77	x	1.2	x	38.42	x	0.63	x	0.7	=	14.09	(80)
West	0.9x	0.77	x	0.6	x	38.42	x	0.63	x	0.7	=	7.05	(80)
West	0.9x	0.77	x	1.2	x	63.27	x	0.63	x	0.7	=	23.2	(80)
West	0.9x	0.77	x	0.6	x	63.27	x	0.63	x	0.7	=	11.6	(80)
West	0.9x	0.77	x	1.2	x	92.28	x	0.63	x	0.7	=	33.84	(80)
West	0.9x	0.77	x	0.6	x	92.28	x	0.63	x	0.7	=	16.92	(80)
West	0.9x	0.77	x	1.2	x	113.09	x	0.63	x	0.7	=	41.48	(80)
West	0.9x	0.77	x	0.6	x	113.09	x	0.63	x	0.7	=	20.74	(80)
West	0.9x	0.77	x	1.2	x	115.77	x	0.63	x	0.7	=	42.46	(80)
West	0.9x	0.77	x	0.6	x	115.77	x	0.63	x	0.7	=	21.23	(80)
West	0.9x	0.77	x	1.2	x	110.22	x	0.63	x	0.7	=	40.42	(80)
West	0.9x	0.77	x	0.6	x	110.22	x	0.63	x	0.7	=	20.21	(80)
West	0.9x	0.77	x	1.2	x	94.68	x	0.63	x	0.7	=	34.72	(80)
West	0.9x	0.77	x	0.6	x	94.68	x	0.63	x	0.7	=	17.36	(80)
West	0.9x	0.77	x	1.2	x	73.59	x	0.63	x	0.7	=	26.99	(80)
West	0.9x	0.77	x	0.6	x	73.59	x	0.63	x	0.7	=	13.49	(80)
West	0.9x	0.77	x	1.2	x	45.59	x	0.63	x	0.7	=	16.72	(80)
West	0.9x	0.77	x	0.6	x	45.59	x	0.63	x	0.7	=	8.36	(80)
West	0.9x	0.77	x	1.2	x	24.49	x	0.63	x	0.7	=	8.98	(80)
West	0.9x	0.77	x	0.6	x	24.49	x	0.63	x	0.7	=	4.49	(80)
West	0.9x	0.77	x	1.2	x	16.15	x	0.63	x	0.7	=	5.92	(80)
West	0.9x	0.77	x	0.6	x	16.15	x	0.63	x	0.7	=	2.96	(80)
Northwest	0.9x	0.77	x	2.62	x	11.28	x	0.63	x	0.7	=	9.03	(81)
Northwest	0.9x	0.77	x	2.62	x	22.97	x	0.63	x	0.7	=	18.39	(81)
Northwest	0.9x	0.77	x	2.62	x	41.38	x	0.63	x	0.7	=	33.13	(81)
Northwest	0.9x	0.77	x	2.62	x	67.96	x	0.63	x	0.7	=	54.41	(81)
Northwest	0.9x	0.77	x	2.62	x	91.35	x	0.63	x	0.7	=	73.14	(81)
Northwest	0.9x	0.77	x	2.62	x	97.38	x	0.63	x	0.7	=	77.98	(81)
Northwest	0.9x	0.77	x	2.62	x	91.1	x	0.63	x	0.7	=	72.95	(81)
Northwest	0.9x	0.77	x	2.62	x	72.63	x	0.63	x	0.7	=	58.15	(81)
Northwest	0.9x	0.77	x	2.62	x	50.42	x	0.63	x	0.7	=	40.37	(81)
Northwest	0.9x	0.77	x	2.62	x	28.07	x	0.63	x	0.7	=	22.47	(81)
Northwest	0.9x	0.77	x	2.62	x	14.2	x	0.63	x	0.7	=	11.37	(81)
Northwest	0.9x	0.77	x	2.62	x	9.21	x	0.63	x	0.7	=	7.38	(81)

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Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m	62.52	118.42	192.31	286.81	363.94	379.65	358.42	298.36	224.79	139.17	77.09	52.06	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	339.43	393.16	456.95	535.6	596.91	597.12	565.99	511.21	445.89	376.3	332.55	321.13	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C): 21 (85)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m=	1	0.99	0.98	0.92	0.78	0.59	0.44	0.5	0.78	0.96	0.99	1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m=	19.83	19.99	20.27	20.63	20.88	20.98	21	20.99	20.91	20.56	20.13	19.79	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m=	19.96	19.96	19.96	19.97	19.97	19.97	19.97	19.97	19.97	19.97	19.96	19.96	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m=	1	0.99	0.97	0.9	0.72	0.5	0.34	0.39	0.7	0.94	0.99	1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m=	18.41	18.65	19.05	19.55	19.86	19.96	19.97	19.97	19.91	19.47	18.84	18.36	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m=	19.2	19.4	19.74	20.15	20.43	20.53	20.54	20.54	20.47	20.08	19.56	19.16	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m=	19.2	19.4	19.74	20.15	20.43	20.53	20.54	20.54	20.47	20.08	19.56	19.16	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Utilisation factor for gains, hm: (94)m=	0.99	0.99	0.97	0.9	0.75	0.55	0.39	0.45	0.74	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m (95)m=	337.48	388.36	442.19	482.46	448.62	328.49	222.83	232.59	329.32	355.78	328.73	319.7	(95)
Monthly average external temperature from Table 8 (96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m] (97)m=	858.46	834.24	760.59	642.94	498.34	336.77	224.06	235.06	362.52	541.32	712.89	857.68	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m=	387.61	299.63	236.89	115.54	36.99	0	0	0	0	138.04	276.59	400.25	

Total per year (kWh/year) = Sum(98)1…5,9…12 = 1891.55 (98)

Space heating requirement in kWh/m²/year: 37.83 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system: 0 (201)

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DER WorkSheet: New dwelling design stage

Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		90.3	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	Ref
Space heating requirement (calculated above)	387.61	299.63	236.89	115.54	36.99	0	0	0	0	138.04	276.59	400.25		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	429.25	331.82	262.33	127.95	40.96	0	0	0	0	152.87	306.31	443.25		(211)
Total (kWh/year) =Sum(211)1…5,10…12=													2094.74	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)1…5,10…12=													0	(215)

Water heating

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	Ref
Output from water heater (calculated above)	162.94	142.33	148.09	131.35	127.17	112	107.31	119.62	120.94	137.72	147.01	159.11		
Efficiency of water heater													81	(216)
(217)m=	87.33	87.08	86.48	85.1	82.92	81	81	81	81	85.4	86.84	87.44		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	186.57	163.45	171.24	154.34	153.35	138.27	132.48	147.68	149.31	161.25	169.29	181.96		
Total = Sum(219a)1…12 =													1909.19	(219)

Annual totals		kWh/year	kWh/year	Ref
Space heating fuel used, main system 1			2094.74	
Water heating fuel used			1909.19	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		120		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		165	(231)
Electricity for lighting			231.81	(232)
Electricity generated by PVs			-561.35	(233)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	Ref
Space heating (main system 1)	(211) x	0.216	=	452.46	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	412.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =			864.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	85.64	(267)

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Electricity for lighting	(232) x	0.519	=	120.31 (268)
Energy saving/generation technologies				
Item 1		0.519	=	-291.34 (269)
Total CO2, kg/year	sum of (265)...(271) =			779.45 (272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			15.59 (273)
EI rating (section 14)				89 (274)

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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.10
Printed on 13 March 2018 at 17:51:50

Project Information:

Assessed By: () **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50m²
Site Reference : 21 John Street **Plot Reference:** Plot 1 Top floor
Address : 21 John Street, London

Client Details:

Name: Jaspar Homes Ltd
Address : 2nd Floor Stanmore House , 15-19 Church Road, Stanmore, HA7 4AR

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)	19.71 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.59 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (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:	Boiler systems with radiators or underfloor heating - mains gas	
	Data from manufacturer	
	Combi boiler	
	Efficiency 89.5 % SEDBUK2009	
	Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

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Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder	
	No cylinder	
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
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	4.8m²	
Windows facing: North West	2.62m²	
Windows facing: South East	1.2m²	
Windows facing: North East	0.6m²	
Windows facing: West	1.2m²	
Windows facing: West	0.6m²	
Windows facing: South East	0.94m²	
Ventilation rate:	6.00	
Blinds/curtains:	Light-coloured curtain or roller blind Closed 60% of daylight hours	

10 Key features

Photovoltaic array

C. General Notes

The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Ensphere Group Ltd for inaccuracies in the data supplied by any other party.

The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

No site visits have been carried out, unless otherwise specified.

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