

# Project No: 9913/10305 London Borough of Camden Energy and Sustainability Statement

Construction of 5 No. New Flats via Proposed Two Storey Extension with Roof Extension to 130 Chalton Street, London, NW1 1RW

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SAP Calculations – SBEM Calculations – Renewable Energy Statements – Energy Performance Certificates Air Tightness Testing – Extract Fan Testing – Water Calculations – DEC Assessments













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## **Executive Summary**

This report has been commissioned to support the planning application to construct 5 No. New Flats (1 x 2 Bed, 2 x 1 Bed, 2 x Studio) through a two storey extension with roof extension at 130 Chalton Street, London, NW1 1RW.

The Energy and Sustainability Statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of energy efficient measures such as enhanced insulation standards, improved heating and lighting efficiencies and the installation of renewable technologies. The methodology used herein is consistent with Approved Document Part L1A (2013) of the Building Regulations and The London Plan 2016.

The report clearly demonstrates that the proposed build specification will ensure that the overall development has a reduced energy demand in comparison to the minimum requirements of Part L1A (2013) of the Building Regulations.

Furthermore, through the installation of solar photovoltaic panels with an overall capacity of 3.30 kWp, the proposed development is predicted to emit at least **26.09%** less regulated carbon dioxide than would ordinarily be permitted by the standard requirements of Part L (2013) of the Building Regulations. The development will also achieve a **21.86%** saving in regulated carbon emissions exclusively through on-site renewable technologies.

The development will also incorporate measures to mitigate future climate change by limiting the risk of summertime overheating and through installing water saving sanitary ware and water outlets

In the circumstances, the proposed development is therefore deemed to comply with policies *CC1*, *CC2* and *CC3* of the *Camden Local Plan (2017)*.

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## **1.0 Introduction**

- 1.1 EPS Group have been appointed to provide an Energy & Sustainability Statement to support the planning application to construct 5 No. New Flats (1 x 2 Bed, 2 x 1 Bed, 2 x Studio) through a two storey extension with roof extension at 130 Chalton Street, London, NW1 1RW.
- 1.2 It is anticipated that the proposed flats will need to comply with the requirements of Approved Document Part L1A 2013 of the Building Regulations if planning is permitted.
- 1.3 The proposed development's energy consumption has therefore been assessed using the National Calculations Method (NCM) SAP 2012 (Standard Assessment Procedure) to determine the predicted annual regulated carbon dioxide (CO<sub>2</sub>) emissions of the development and the associated reduction targets.
- 1.4 The following fuel emissions factors have been utilised within the supporting calculations as defined by the updated National Calculations Method (NCM):

Table 1: NCM Fuel Emission Factors		
Fuel	CO <sub>2</sub> emission factor (kgCO <sub>2</sub> /kWh)	
Natural gas	0.216	
Grid supplied electricity	0.519	
Grid displaced electricity	0.519	

- 1.5 This document should be used for planning purposes only and should be re-assessed and resubmitted at the Building Control stage if alternative building specifications or proposed systems are followed to those outlined within the report.
- 1.6 It is also highlighted that the SAP calculations utilised within the report rely on a number of standard operational parameters which may not ultimately match the actual measures adopted within the finalised building. Whilst they provide a 'like for like' comparison for the purpose of this report, they are not valid for Building Control applications or for the actual operation of the development post completion.
- 1.7 The dimensions for all units that are referenced within this report are based upon SAP measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

# 2.0 Planning Policy Context

## 2.1 National

The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these are expected to be applied by local authorities. Section 14 of this document details how local policies should address climate change through the promotion of energy efficiency and the adoption of low carbon and renewable technologies. It states:

#### "14.0 Meeting the challenge of climate change, flooding and coastal change

148. 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.

#### Planning for climate change

- 149. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
- 150. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

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

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

- 152. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
- 153. In determining planning applications, local planning authorities should expect new development to:

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

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

154. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."

## 2.2 The London Plan

The London Plan is the overall strategic plan for London detailing a fully integrated economic, environmental, transport and social framework for the development of the city until 2031.

Policy 5.2 of The London Plan March 2016 (Consolidated with Alterations Since 2011) relates to '*Minimising Carbon Dioxide Emissions*' and states:

- *"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*
- B. The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

	Improvement on 2010 Building Regulations*			
Year	Residential buildings	Non-domestic buildings		
2010 - 2013	25 per cent	25 per cent		
2013 - 2016	40 per cent	40 per cent		
2016 - 2019	Zero carbon	As per building regulations requirements		

### Residential

### (\*Please reference additional April 2014 guidance detailed below)

- C. Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.
- D. As a minimum, energy assessments should include the following details:
  - a) Calculation of the energy demand and carbon dioxide emissions covered by 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*
  - *d) Proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.*
  - e) The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere."

## April 2014 Update to Energy Planning Guidance

Following the introduction of Approved Documents Part L1A and L2A 2013 of the Building Regulations on April 6th 2014, The Greater London Authority issued updated guidance on Energy Planning.

This document states:

"As outlined in the Sustainable, Design and Construction SPG, from 6 April 2014 the Mayor will apply a 35 per cent carbon reduction 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 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013--2016."

## 2.3 London Borough of Camden

The relevant policies from the *Camden Local Plan (2017)* are detailed 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 emissions have been met;
- c. ensure that the location of 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, King's 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."

### Policy CC2 Adapting to climate change

"The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

- a. the protection of existing green spaces and promoting new appropriate green infrastructure;
- b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy. Any development involving 5 or more residential

units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures The Council will promote and measure sustainable design and construction by:

- e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
- f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards; e.g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and
- h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019"

### Policy CC3 Water and flooding

*"The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.* 

We will require development to:

- a. incorporate water efficiency measures;
- b. avoid harm to the water environment and improve water quality;
- c. consider the impact of development in areas at risk of flooding (including drainage);
- d. incorporate flood resilient measures in areas prone to flooding;
- e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
- *f. not locate vulnerable development in flood-prone areas.*

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore"

Further guidance on how compliance with the above policies can be achieved is provided by within Camden's Special Guidance Document entitled *Energy efficiency and adaptation (March 2019).* 

The following exerts are of particular relevance to this Energy & Sustainability Statement:

#### *"5. Renewable energy technologies*

#### KEY MESSAGES

- There are a variety of renewable energy technologies that can be installed to supplement a development's energy needs.
- Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.

- 5.1 All developments should consider the feasibility of on-site renewable energy generation. Renewable energy generation should only be considered once the earlier stages of the energy hierarchy have been followed and energy demand has been reduced as far as possible.
- 5.2 In areas of poor air quality, there is an expectation of zero emission buildings. Developers should look to prioritise the installation of renewable energy technologies with no polluting emissions. These can be air, ground, or water heat pumps and potentially efficient direct electric 'point of use' heaters to supply a hot water load, unless found to be unfeasible.
- 5.3 As per paragraph 8.11 of the Local Plan, developments (including refurbishments) of 5 or more dwellings and/or 500 sqm or more of any gross internal floorspace must demonstrate a 20% 'Be Green' stage carbon dioxide reduction from renewables. Where feasible the renewables target should be fully met or exceeded, regardless of whether overall carbon dioxide reduction targets have already been met (those for minor new build residential and major applications specified in Table 1) through earlier stages of the energy hierarchy."

### *"7. Energy reduction*

### **KEY MESSAGES**

- All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy.
- All new build major development to demonstrate compliance with London Plan targets for carbon dioxide emissions.
- Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings.
- All new build residential development (of 1 9 dwellings) must meet 19% carbon dioxide reduction; and
- Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation
- 7.1 The carbon reduction targets for developments in Camden are outlined in Table 2a and 2b below. This will be updated in line with any subsequent updates to the Local Plan, national and London planning policy.
- 7.2 Part L of the Building Regulations sets out the minimum requirements that buildings must meet relating to the conservation of fuel and power. Developments in Camden are expected to exceed Part L of Building Regulations through the application of the energy hierarchy. Camden's planning policies use Part L calculations as a baseline that should be exceeded. Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings. All other refurbishments should demonstrate quantifiable improvements against the relevant new build baseline, L1A or L2A.

## Carbon offsetting

7.3 Where the London Plan carbon dioxide reduction targets cannot be met on-site (Local Plan paragraph 8.12), we may accept the provision of carbon reduction measures elsewhere in the borough, or secure a S106 financial contribution to Camden's Carbon Offset Fund. The Carbon Offset Fund is used to secure the delivery of carbon reduction projects in Camden. Projects will be connected to those identified in the Council's environmental sustainability plan 'Green Action for Change'.

7.4 Camden Council aligns the price per tonne of carbon with the GLA's pricing strategy. Please note: this is subject to change as further viability studies are undertaken. Details of the current pricing strategy are outlined on our website. Any offsetting project managed by the developer will need to demonstrate like-for-like savings and will need to be additional to any planned projects. Funds cannot be used to support other, existing development proposals to meet carbon reduction targets.

## Table 2a Energy reduction targets, domestic

Development should comply with these standards / provide this information	Residential New Build (assessed under L1A)				ential Refurbis sessed under L	
	Major (10+ units or >1,000 sqm new floor space)	Medium (5-9 units, >500sq.m and <1,000 sqm new floor space)	Minor All new dwellings (up to 4 units and <500 sqm new floor space)	Major (10+ units or >1,000 sqm)	Medium (5-9 units, >500sq.m and <1,000 sqm)	Minor (up to 4 units and <500 sqm
		Energy and c	arbon reductio	on targets		
Overall carbon reduction targets:	Zero Carbon (minimum 35% reduction beyond Part L on site) (London Plan 5.2, Local Plan CC1)	19% below Part L of 2013 Building Regulations (Local Plan CC1)	19% below Part L of 2013 Building Regulations (Local Plan CC1)	Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan 5.4, Local Plan CC1	Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan 5.4, Local Plan CC1	Greatest possible reduction - meeting Part L1B for retained thermal elements (London Plan 5.4, Local Plan CC1
Reduction in CO2 from onsite renewables (after all other energy efficiency measures have been incorporated)	20% (London Plan 5.7, Local Plan CC1)	20% (London Plan 5.7, Local Plan CC1)	lncorporate renewables where feasible	20% (London Plan 5.4, 5.7, Local Plan CC1)	20% (London Plan 5.4, 5.7, Local Plan CC1)	20% (London Plan 5.4, 5.7, Local Plan CC1)

## 2.4 Conclusions

On review of the planning policies and associated guidance documents outlined above, it is evident that the proposed scheme will need to achieve a significant reduction in regulated carbon dioxide emissions (CO<sub>2</sub>) by following the principles of the energy hierarchy as detailed within the London Plan.

In particular, a 20% reduction in regulated  $CO_2$  emissions will need to be achieved through the local installation of low carbon or renewable technologies (the green step of the energy hierarchy). In satisfying this stipulation, the development will also comply with the more generalised requirement of policy CC1 which requires a minimum reduction in overall regulated  $CO_2$  emissions of 19% against the requirements of Part L1A 2013 of the Building Regulations.

It is also noted that the proposed scheme will need to take measures to reduce summertime overheating and to ideally avoid the need to provide mechanical cooling. The proposed dwellings will also need to be water efficient whilst also minimising the risks of localised flooding.

## 3.0 Energy Statement Methodology

- 3.1 As detailed within Paragraph 1.3, SAP 2012 has been utilised as an appropriate method for calculating the predicted energy consumption and the associated carbon dioxide emissions for the proposed development across a number of different scenarios.
- 3.2 Where information was unavailable due to the lack of detail ordinarily associated with Building Control specifications, details from previous comparable projects have been utilised. Alternatively, industry standard defaults and assumptions have been adopted and consistently applied across all variant calculations.
- 3.3 In the first instance a set of 'Notional' Baseline SAP Calculations were produced as outlined within Section 4.0 in order to determine the amount of annual regulated carbon dioxide (CO<sub>2</sub>) emissions that would be permitted for the proposed development under the standard requirements of Approved Document Part L1A (2013).
- 3.4 In response to the Energy Hierarchy of the London Plan 2016, a range of conventional energy efficiency improvements are proposed for the development which have then been modelled within SAP in order to produce a set of 'Lean' Energy Calculations as detailed within Section 5.0.
- 3.5 In accordance with the 'Clean' step of the Energy Hierarchy, the feasibility of utilising decentralised energy networks or Combined Heat and Power (CHP) was then reviewed as detailed within Section 6.0.
- 3.6 The suitability of a wide range of renewable technologies have been reviewed for potential inclusion within the development. Supporting calculations are provided within Section 8.0 as a means of quantifying the associated carbon reduction arising from this 'Green' step of the energy hierarchy.

# 4.0 Notional Benchmark Energy Calculations

- 4.1 An initial set of SAP calculations were produced for the proposed development as a means of determining the notional benchmark energy consumption and associated carbon dioxide (CO<sub>2</sub>) emissions that would ordinarily be expected under Part L1A (2013) of the Building Regulations.
- 4.2 The CO<sub>2</sub> emissions arising from the predicted unregulated energy consumption within the proposed development were also calculated in order to determine the full CO<sub>2</sub> footprint of the proposed development as per the requirements of the London Plan.
- 4.3 It is noted that the calculated unregulated carbon emissions are not subject to target reductions required by Policy 5.2 of the London Plan or CC1 & CC2 of the Camden Local Plan.
- 4.4 The calculated Benchmark SAP Calculations are detailed within Table 2 below with a selection of Target Emission Rate (TER) calculation worksheets provided in Appendix 1 for detailed review (all other instances are available by request).

Table 2: Benchmark Annual Energy Consumption and $CO_2$ Emissions (SAP 2012)					
Dwelling	Floor Area (m²)	Part L1A Target Emission Rate (TER)	Annual 'Baseline' Regulated Energy Consumption (kWhr / Year)	Annual 'Baseline' Regulated CO <sub>2</sub> Emissions (Kg / Year)	Annual 'Baseline' Unregulated CO <sub>2</sub> Emissions (Kg / Year)
Flat 1	50.49	18.80	3,959.81	949.05	1,039.93
Flat 2	37.94	22.38	3,565.94	848.92	841.16
Flat 3	50.49	19.25	4,066.82	972.16	1,039.93
Flat 4	37.94	22.85	3,649.38	866.94	841.16
Flat 5	68.84	20.38	5,927.64	1,402.69	1,325.23
Total Regulated Baseline CO <sub>2</sub> Emissions (Kg / Year)					5,039.76
Total Unregulated Baseline CO <sub>2</sub> Emissions (Kg / Year)					5,087.41
Overall (Regulated and Unregulated) Baseline CO <sub>2</sub> Emissions (Kg / Year)					10,127.17
Total Regulated Baseline Energy Consumption (kWhr / Year)					21,169.59

4.5

On review of the above, it is evident that the proposed development would be permitted to emit up to **5,039.76 KgCO<sub>2</sub>/year** under occupancy if it was constructed to the minimum energy performance standards required by Part L1A 2013.

## 5.0 **Proposed Energy Strategy and Performance – Lean Measures**

5.1 In accordance with the 'Lean' principles of the Energy Hierarchy, it is provisionally proposed to adopt the following minimum fabric, heating and lighting standards within the apartments as a means of reducing the overall energy demand of the development by conventional (lean) means:

Table 3: Proposed 'Lean' Fabric, HVAC and Lighting Standards				
Element / Feature	Current Part L1A 2013 Minimal Acceptable Standard	Proposed Development Target		
External Wall U-value	0.30 W/m <sup>2</sup> K	0.22 W/m <sup>2</sup> K		
Separating Walls to Unheated Access Space	0.30 W/m <sup>2</sup> K	0.22 W/m²K		
Party Walls	0.20 W/m <sup>2</sup> K	0.00 W/m²K		
Roof Insulated at Rafter	0.20 W/m <sup>2</sup> K	0.15 W/m²K		
Flat Roof U-value	0.20 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K		
Windows & Rooflights	2.00 W/m <sup>2</sup> K	1.40 W/m <sup>2</sup> K		
Air Permeability	10 m³/m³.h	4.50 m³/m².h		
Thermal Bridging	-	Accredited Construction Details		
Lighting	75% low energy lights	100% low energy lights		
Heating (Gas Combi)	Min 88% (SEDBUK 2009) Efficient Boiler	89.6% Efficient Boiler - Ideal Logic Combi ESP1 26		
Heating Controls	Programmer, Thermostat & TRVs	Delayed Start Thermostat, Programmer and TRVs		
Ventilation	-	Intermittent Extract Fans to Kitchens & Bathrooms		

- 5.2 The impact of the above 'Lean' measures on the proposed development's overall annual carbon dioxide emissions was determined by updating the Baseline SAP Calculations referenced in Section 4.0.
- 5.3 The results of the Lean Calculations are summarised in Table 4 below with a selection of the Dwelling Emission Rate SAP Worksheets provided in Appendix 2 of this report for detailed review (all other instances are available by request):

Tab	Table 4: 'Lean' Annual Energy Consumption and CO <sub>2</sub> Emissions (SAP 2012)				
Apartment Floor Are (m²)		Part L1A 'Lean' Dwelling Emission Rate (DER)	Annual 'Lean' Regulated Energy Consumption (kWhr / Year)	Annual 'Lean' Regulated CO <sub>2</sub> Emissions (Kg / Year)	
Flat 1	50.49	17.74	3,713.91	895.78	
Flat 2	37.94	21.51	3,415.47	815.99	
Flat 3	50.49	18.14	3,808.03	916.10	
Flat 4	37.94	21.82	3,470.92	827.96	
Flat 5	68.84	19.05	5,505.60	1,311.53	
Total Regulat	4,767.36				
Total Regulated 'Lean' Energy Consumption (kWhr / Year)				19,913.93	

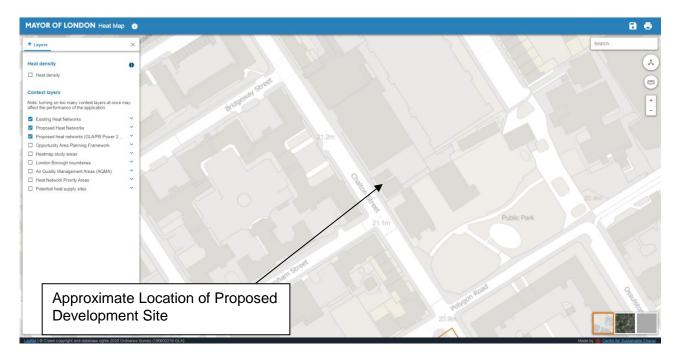
5.4 As a result of adopting the recommended 'Lean' energy efficient measures outlined within paragraph 5.1, the proposed development will have a reduced annual level of regulated CO<sub>2</sub> emissions of **4,767.36 KgCO<sub>2</sub>/year.** This represents a total reduction of **5.40%** in comparison to the Baseline Carbon Dioxide Emissions detailed within Section 4.0.

## 6.0 **Proposed Energy Strategy and Performance – Clean Measures**

6.1 Where feasible, The London Plan 2016 heavily advocates the use of decentralised energy, including district heating and cooling and Combined Heat and Power (CHP). As well as forming the 'Clean' step of the aforementioned Energy Hierarchy, Policy 5.5 - Decentralised Energy Networks states that:

"The Mayor expects 25 per cent of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025. In order to achieve this target the Mayor prioritises the development of decentralised heating and cooling networks at the development and area wide levels, including larger scale heat transmission networks."

6.2 On consulting the London Heat Map (see below), it is apparent that there is no existing or potential Energy Network within the immediate vicinity of the proposed development and as such any possible connection to an existing or planned network is unviable in this instance.



*Figure 1: Results of the London Heat Map Search within Vicinity of the Development* 

- 6.3 Combined Heat and Power (CHP) units conventionally produce electricity at a localised level from mains gas. In generating electricity in this manner, the technology reduces the losses associated with the inefficient transportation of electricity across the national grid, whilst also producing large quantities of heat as a by-product. This heat can then be harvested and used for the provision of localised heating and hot water.
- 6.4 CHP units are not suitable for all developments as they require sustained heat load demands in order to achieve maximum operating efficiencies. Since there are no economic or sustainability benefits associated with oversizing a CHP installation, a large proportion of smaller developments are often unsuitable for this technology.
- 6.5 On review of the above circumstances coupled with a growing concern on the detrimental impact that CHP equipment can have on urban air quality, the use of this technology within the development is deemed to be unviable.

## 7.0 Review of Renewable Technologies

7.1 In response to the 'Green' requirement of the Energy Hierarchy coupled with the specific requirements of policy CC1 of Camden's Local Plan, a number of different renewable technologies have been reviewed in terms of their overall suitability for inclusion within the proposed development.

## 7.2 Wind Turbine (Column or Roof Mounted)

• When installed in optimum positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Feed-in-Tariff scheme.
• Not aesthetically pleasing and will not be in keeping with the local
area.
• The site is too sheltered as a result of its general urban location which would result in unreliable and insufficient outputs.
• Require on-going maintenance which future occupants may neglect.
• Can produce unacceptable levels of noise to occupants and neighbours.
• Strong public resistance to constructing new land based wind turbines
• The technology is not deemed as being suitable for use within the proposed development.

### 7.3 Solar Photovoltaic

Benefits	<ul> <li>When installed in optimum positions photovoltaic (PV) arrays can generate a large amount of renewable electricity which can be used locally or exported at financial gain to the national grid via the Feed-in-Tariff scheme.</li> <li>Minimal on-going costs &amp; maintenance issues following installation.</li> <li>Easy to integrate into a conventional build specification or retrofit applications</li> <li>The development has a large flat roof area which could facilitate the horizontal installation of panels as a means of minimising the visual impact of the technology. Alternatively angled array stands could be used to help achieve optimal orientation and pitch to maximise generation efficiencies.</li> </ul>		
Site Limitations / Restrictions	<ul> <li>PV panels are not ascetically pleasing and may detract from the visual appearance of the building although this can be minimised by installing the panels in a horizontal position as described above.</li> <li>The adjacent building will cause some overshading to the proposed development's roof which will reduce the generational efficiency of any installed panels</li> </ul>		
Conclusion	<ul> <li>It is proposed to use this technology within the development.</li> </ul>		

## 7.4 Solar Thermal

Benefits Site Limitations / Restrictions	<ul> <li>Solar hot water systems can provide an efficient way of contributing to developments overall hot water requirements.</li> <li>Minimal on-going costs &amp; maintenance issues following installation.</li> <li>May be eligible for payments under the Renewable Heat Incentive.</li> <li>As with PV the development benefits from a large flat roof area which could be used to site solar collectors.</li> <li>The amount of CO<sub>2</sub> savings with this technology is restricted as there is no benefit to producing more hot water than is used within a dwelling.</li> <li>Solar collectors are not aesthetically pleasing and may detract from the visual appearance of the development although this could be mitigated by installing panels horizontally.</li> <li>Requires the installation of hot water cylinders / thermal stores which would introduce an additional source of energy loss to the dwellings whilst also potentially restricting useable floor space.</li> <li>The length of pipe runs to thermal stores need to be kept to a minimum.</li> </ul>
Conclusion	<ul> <li>The technology is not deemed as being suitable for use within the proposed development.</li> </ul>

## 7.5 **Ground Source Heat Pump**

Benefits	<ul> <li>High operating efficiencies (CoPs).</li> <li>Flexible installation options for new build properties including trench and borehole installations</li> <li>Reliable and proven technology.</li> <li>Generally low maintenance costs.</li> <li>No visual impact on the property.</li> <li>Eligible for payments under the Renewable Heat Incentive.</li> </ul>
Site Limitations / Restrictions	<ul><li>Detailed ground surveys required.</li><li>High capital installation costs</li></ul>
Conclusion	• It is not proposed to use this technology within the development.

## 7.6 Air Source Heat Pump

Popofita	Lich exercise officiencies (CoDe)	
Benefits	<ul> <li>High operating efficiencies (CoPs).</li> </ul>	
	<ul> <li>Reduced visual impact on the property.</li> </ul>	
	Reliable and proven technology.	
	Generally low maintenance costs.	
Site	• Often require a supplementary immersion heating system.	
Limitations / • The external units can result in some noise related		
Restrictions	although this can be limited through the careful selection of	
	particular models with low operating acoustic levels and the	
	potential use of acoustic housing units.	
Conclusion	• It is not proposed to use this technology within the development.	

## 7.7 **Biomass Boilers**

Benefits	Reliable and proven technology.
	Eligible for payments under the Renewable Heat Incentive
Site	Require large storage facilities for the fuel.
Limitations /	• On-going cleaning, maintenance and management requirements.
Restrictions	Require regular fuel deliveries.
	Would contribute to poor urban air quality.
Conclusion	• The technology is not deemed as being suitable for use within the
	proposed development.

- 7.8 On review of the above technologies, the use of PV panels is recommended as being the most viable and cost effective technology for use within the proposed development. This will provide a local source of renewable electricity for occupant use as well as providing a significant and affordable reduction in the calculated carbon dioxide emissions.
- 7.9 It is therefore proposed to install a PV array with a minimum output capacity of 3.30 kWp to the flat roof of the proposed development. The panels will be installed in a horizontal plane so that they cannot be seen from street level.
- 7.10 It is expected that the proposed PV array will comprise of 11 x 300W panels requiring approx. 18.70m<sup>2</sup> of roof space.

## 8.0 **Proposed Energy Strategy and Performance – Green Measures**

- 8.1 Having identified the use of photovoltaic panels as being the most suitable renewable technology for use within the development, the 'Lean SAP Calculations detailed in Section 5.0 were updated to incorporate the proposed 3.30 kWp PV Array detailed within paragraphs 7.8 7.10.
- 8.2 The key results of the Proposed (Green) Calculations are summarised in Table 5 below with a selection of the Dwelling Emission Rate SAP Worksheets provided in Appendix 3 of this report for detailed review (all other instances are available by request):

Table 5: Proposed 'Green' Annual Energy Consumption and $CO_2$ Emissions (SAP 2012)									
Apartment	Floor Area (m²)	Part L1A 'Green' Dwelling Emission Rate (DER)	Annual 'Green' Regulated Energy Consumption (kWhr / Year)	Annual 'Green' Regulated CO <sub>2</sub> Emissions (Kg / Year)					
Flat 1	50.49	13.50	3301.42	681.69					
Flat 2	37.94	17.26	3105.19	654.95					
Flat 3	50.49	13.90	3395.54	702.02					
Flat 4	37.94	17.58	3160.64	666.93					
Flat 5	68.84	14.81	4942.84	1019.46					
Total Regulat	Total Regulated 'Green' CO2 Emissions (Kg / Year)3,725.05								
Total Regulat	ed 'Green' En	ergy Consumptio	on (kWhr / Year)	17,905.63					

- 8.3 As a result of installing the renewable technologies specified within Section 7.0 and by also adopting the 'Lean' measures detailed in Section 5.0, it is evident that the proposed development will have a total reduced level of annual regulated CO<sub>2</sub> emissions of **3,725.05 KgCO<sub>2</sub>/year**, this represents a total reduction of **26.09%** beyond the standard requirements of Part L1A 2013 of the Building Regulations.
- 8.4 It is also noted that the development achieves on site CO<sub>2</sub> emissions savings of **21.86%** exclusively from the installation of renewable sources.

# 9.0 Energy Calculation Summary

9.1 The results of the various Energy Calculations detailed within this report are summarised within the tables below:

Table 6: Carbon Dioxide Emissions after each stage of the Energy Hierarchy								
	Carbon dioxide emissions Regulated	(Tonnes CO2 per annum) Unregulated						
Baseline: Part L 2013 of the Building Regulations Compliant Development	5.040 (A)	5.087						
After energy demand reduction	4.767 (B)	5.087						
After CHP	4.767 (C)	5.087						
After renewable energy	3.725 (D)	5.087						

Table 7: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy								
		n Dioxide savings						
	(Tonnes CO <sub>2</sub> per annum)	%						
Savings from energy demand reduction	0.273	5.417						
Savings from CHP	0.000	0.000						
Savings from renewable energy	1.042	21.86						
Cumulative On Site Savings	1.315	26.09						

9.2 In the circumstances, the proposed development is therefore deemed to satisfy the requirements of policy *CC1: Policy CC1 Climate change mitigation* of the *Camden Local Plan (2017).* 

# 10.0 Overheating Risk Analysis

- 10.1 Asides from achieving an increased level of energy performance, the proposed dwellings have been designed to mitigate the risks of summertime overheating by adopting internal layouts that facilitate natural cross ventilation. This should provide a passive cooling mechanism which will be particularly effective given that all units will be on or above the third floor level where occupants will be able to securely leave the windows open throughout the day.
- 10.2 The Green SAP Calculations referenced within Section 8 were utilised to perform a preliminary Part L1A Summertime Overheating Risk Analysis (as per Criterion 3 of Part L1A 2013).
- 10.3 The results of the Overheating Check are summarised within Table 8 below, with several example SAP 2012 Overheating Assessments provided within Appendix 4 for detailed review (all other instances are available upon request):

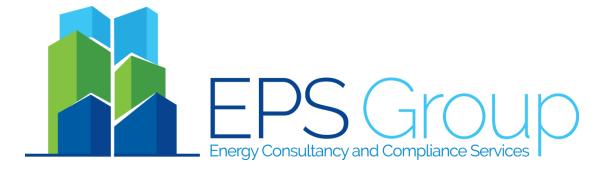
Table 8: Part L1A 2013 Criterion 3: Summertime Overheating Risk Analysis									
	Floor Area (m <sup>2</sup> )	Calculated Overheating Risk							
Flat 1	50.49	Slight							
Flat 2	37.94	Slight							
Flat 3	50.49	Slight							
Flat 4	37.94	Slight							
Flat 5	50.49	Slight							

# 10.4 **On review of the above, it is evident that at this stage of design, the proposed dwellings do not appear to be at significant risk of overheating.**

10.5 It is acknowledged that the Overheating Risk associated with Part L1A 2013 is somewhat limited. It is therefore advised to undertake CIBSE TM59 and TM49 dynamic overheating modelling in conjunction with the detailed design process if planning permission for the development is granted.

## **11.0** Water Management Internal Water Consumption

- 11.1 It is noted that since the proposed development involves the addition of extra storeys to an existing building there will be no increase in surface water runoff as a result of the proposal. The proposals are therefore unlikely to increase the risk of any localised flooding.
- 11.2 The internal water consumption of the dwellings will be reduced through the specification of water saving outlets such as reduced volume / dual flush cisterns, reduced bath capacities and by installing taps and showers with reduced flow rates or inline flow restrictors. This will provide a reduced water consumption of less than or equal to 110 litres per person per day in line with the higher technical standard of Part G of the Building Regulations.
- 11.3 The following provisional specification is proposed for the development's water outlets and sanitary ware which will achieve an internal potable water consumption of **109.27 litres per person per day**. A Water Efficiency Calculation is provided within Appendix 5 of this report for detailed review:
  - Toilets = 5I (Full) and 3I (Part)
  - Basin taps = 4l/min
  - Baths = 170l
  - Showers = 8.5l/min
  - Kitchen taps = 6l/min
- 11.4 The proposed development is therefore deemed to satisfy *Policy CC3 Water and flooding of the Camden Local Plan.*



# Appendix 1:

**Baseline TER Calculations (SAP Derived)** 



#### Project Information Building type Mid-floor flat

9913		
3 March 2020		
GBS Architectural Design	Project	Flat 1
Lombard Business Park		130 Chalton Street
8 Lombard Road		London
Wimbledon		NW1 1RX
SW19 3TZ		
	3 March 2020 GBS Architectural Design Lombard Business Park 8 Lombard Road Wimbledon	3 March 2020 GBS Architectural Design Project Lombard Business Park 8 Lombard Road Wimbledon

## **EPS** Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

							Area (m²)		Av. Storey height (m)		Volume (m³)		
	d other floors	i					50.49		2.40		121.1		(3a)
Total floor Dwelling N	area /olume (m³)						50.49				121.1		(4) (5)
2. Ventilai	tion rate										m³ r	er hour	
							main + seon	dary + oth	er			or nour	
							heating						
	f chimneys						0 + 0 + 0		x 40			0.00	(6a)
	f open flues						0 + 0 + 0		x 20			0.00	(6b)
	f intermittent						2		x 10			20.00	(7a)
	f passive ve						0		x 10			0.00	(7b)
Number of	f flueless ga	s fires					0		x 40			0.00	(7c)
											Air	hanges	per hour
Infiltration	due to chimi	neys, fans ar	nd flues									0.17	(8)
	est, result q	-							5.00				(17)
Air perme	ability											0.42	(18)
Number of	f sides on w	hich sheltere	d									3.00	(19)
Shelter fac	ctor											0.78	(20)
		ating shelter										0.32	(21)
Infiltration	rate modified	d for monthly	wind speed										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
					1				и			52.50	(22)
Wind Fact	or												
1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18		
Adjusted i	nfiltration rate	e (allowing fo	r shelter an	t wind sneed	4)							13.13	(22a)
0.41	0.40	0.39	0.35	0.35	0.31	0.31	0.30	0.32	0.35	0.36	0.38		
0.41	0.40	0.39	0.35	0.35	0.31	0.31	0.30	0.32	0.35	0.30	0.38	4.22	(22b)
	: natural ve iir change ra	ntilation, inter te	mittent extra	ct fans								4.ZZ	(220)
0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
													. ,

#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat los	sses and he	at loss parai	meter										
Element		Gross		nings	Net area		U-value	Ax	U				
		area, m <sup>2</sup>	m²		A, m <sup>2</sup>		W/m <sup>2</sup> K	W/K					()
	-	ed, air-filled, at (SouthWe	st)		1.40	00	1.33 (1.40	)	1.86				(27)
	-	ed, air-filled, at (SouthWe	st)		1.40	00	1.33 (1.40	)	1.86				(27)
W2		ed, air-filled,			1.4	00	1.33 (1.40	)	1.86				(27)
low-E, En= W3	=0.1, soft co	at (SouthWe	st)										
	-	ed, air-filled, at (SouthEas	st)		0.99	90	1.33 (1.40	)	1.31				(27)
	-	ed, air-filled, at (SouthEas	st)		0.99	90	1.33 (1.40	)	1.31				(27)
Window -	÷	ed, air-filled, at (SouthEas	st)		1.20	00	1.33 (1.40	)	1.59				(27)
Window -	-	ed, air-filled, at (SouthWe	st)		1.40	00	1.33 (1.40	)	1.86				(27)
Window -	-	ed, air-filled, at (NorthEas	.t)		1.29	90	1.33 (1.40)	)	1.71				(27)
Window - low-E, En=	-	ed, air-filled, at (NorthEas	t)		0.63	20	1.33 (1.40	)	0.82				(27)
	=0.1, soft co	azed, air-fille at (NorthEas			1.94	40	1.(	00	1.94				(26)
Walls		Jnheated Co	ridor		10.	73	0.2	18	1.93				(29)
Walls	0	Jinealeu Cu	nuoi		43.	38	0.1	18	7.81				(29)
External Party wall					9.	38	0.0	00	0.00				
		elements Sig	jma A, m²									66.74	(31)
	t loss, W/K		<i>/ · · ·</i>									25.85	(33)
	nass parame nermal bridge	eter, kJ/m <sup>2</sup> K	(user-specif	ied TIVIP)							2	50.00 7.42	(35)
Total fabric	•	55										7.42 33.27	(36) (37)
		alculated mo	nthly									55.27	(37)
23.36	23.23	23.10	22.50	22.38	21.86	21.86	6 21.7	6 22.06	22.38	22.61	22.85		(38)
Heat transf	fer coefficier	it, W/K			]	I							
56.63	56.50	56.37	55.77	55.66	55.14	55.14	4 55.0	4 55.34	55.66	55.89	56.12		
Heat loss <sub>l</sub>	parameter (I	HLP), W/m²K									!	55.77	(39)
1.12	1.12	1.12	1.10	1.10	1.09	1.09	1.09	1.10	1.10	1.11	1.11		
HLP (averation of Number of	•	onth (Table 1	a)	H		I	л	η	N		л	1.10	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		
51		51	30		50	51		30	51		51		

SAP 2012 worksheet for notional dwelling - calcu	lation of target emissions
SAF 2012 WOLKSHEELIOL HOUDHALUWEIIING - CAICU	

	occupancy, erage hot wa		litres ner	day. Vd aver	ane						1 74
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
lot water u	usage in litre	s per day fo	r each mor	ith							
82.15	79.16	76.18	73.19	70.20	67.21	67.21	70.20	73.19	76.18	79.16	82.15
Energy con	ntent of hot w	vater used			][	][		][		I	
121.83	106.55	109.95	95.86	91.98	79.37	73.55	84.40	85.41	99.53	108.65	117.98
Energy cor Distribution	ntent (annual loss	)					Я		][	JLJL	1175
18.27	15.98	16.49	14.38	13.80	11.91	11.03	12.66	12.81	14.93	16.30	17.70
lot water /olume fac emperatur	re factor t from store	factor (kW	n/day)								0.0 0.0 0.0 0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
let storage	e loss	я	JI		I		л	JLJ	п.	лл	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary lo	ss						- A	-1		r.	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi loss	calculated 1	for each mo	nth								
41.86	36.44	38.82	36.09	35.77	33.15	34.25	35.77	36.09	38.82	39.04	41.86
otal heat	required for	water heatin	g calculated	I for each m	ionth						
163.69	142.99	148.77	131.95	127.75	112.52	107.80	120.17	121.50	138.35	147.69	159.85
	n water heat	7	-1	~~~~							
163.69	142.99	148.77	131.95	127.75	112.52	107.80	120.17	121.50	138.35	147.69	159.85
leat nains	from water	heating kW	h/month								1623
50.97	44.54	46.26	40.90	39.53	34.68	33.02	37.01	37.42	42.80	45.88	49.70
<i>5. Internal</i> Jan	<i>gains</i>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	gains, Watts		r								
85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23
ighting ga	lins		1		][	][		JL	][	][	
13.27	11.78	9.58	7.26	5.42	4.58	4.95	6.43	8.63	10.96	12.79	13.64
ppliances	gains	JL	J		]	]L	I	JL_JL	N		I
148.51	150.05	146.16	137.90	127.46	117.65	111.10	109.56	113.44	121.71	132.15	141.95
Cooking ga	ains	^	.n.		л	л	^	л	n	. п.	- n
31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52
oumps and	d fans gains	л	л	R	л	л	л	лл	я.	дд	лл
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
.osses e.g	g. evaporatio	n (negative	values)		-1			- 4			
-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18
Vater heat	ing gains										
68.51	66.28	62.18	56.80	53.13	48.16	44.38	49.74	51.97	57.53	63.73	66.79
otal intern	nal gains										
281.86	279.68	269.50	253.52	237.58	221.96	211.99	217.30	225.62	241.76	260.24	273.95

SAP 2012 worksheet for notional dwelling - calculation of target emissions

6. Solar gains (calculati	ion for Jan	uary)									
				Area & Fl			g & FF		Shading	Gains	
Window - Double-glazec coat (SouthWest) W1	l, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)0 36.79		0.63 x 0.70		0.77	15.	.742
Window - Double-glazec coat (SouthWest)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)0 36.79		0.63 x 0.70		0.77	15.	.742
W2											
Window - Double-glazec coat (SouthWest) W3	l, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)0 36.79		0.63 x 0.70		0.77	15.	.742
Window - Double-glazec coat (SouthEast) W5	l, air-filled,	low-E, En=0	.1, soft	0.9 x 0.99	90 36.79		0.63 x 0.70		0.77	11.	.132
Window - Double-glazed coat (SouthEast) W7	l, air-filled,	low-E, En=0	.1, soft	0.9 x 0.99	90 36.79		0.63 x 0.70		0.77	11.	.132
Window - Double-glazec coat (SouthEast) W6	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.20	)0 36.79		0.63 x 0.70		0.77	13.	.493
Window - Double-glazec coat (SouthWest) W4	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)0 36.79		0.63 x 0.70		0.77	15.	.742
Window - Double-glazed coat (NorthEast) W8	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.29	11.28		0.63 x 0.70		0.77	4.	.448
Wo Window - Double-glazed coat (NorthEast)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 0.62	20 11.28		0.63 x 0.70		0.77	2.	.137
W9 Solid door - Double-glaz coat (NorthEast)	ed, air-fille	d, low-E, En=	=0.1, soft	0.9 x 1.94	10 0.00		0.63 x 0.70		0.77	0.	.000
Entrance Door Total solar gains, Janua	arv									1	05.3
Solar gains	5										
105.31 181.58	254.25	324.77	372.66	373.88	358.83	322.50	278.58	202.25	126.54	89.87	
Total gains			J								
387.17 461.25	523.75	578.29	610.24	595.84	570.82	539.80	504.20	444.01	386.78	363.82	
307.17 401.23	525.75	576.29	010.24	595.64	570.82	559.00	504.20	444.01	300.70	303.02	
Lighting calculations											
Window - Double-glazec coat (SouthWest)	I, air-filled,	low-E, En=0	.1, soft	Area 0.9 x 1.40	)		g 0.80		FF x Shading 0.70 x 0.83	1	0.5
W1 Window - Double-glazec coat (SouthWest)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)		0.80		0.70 x 0.83		0.5
W2 Window - Double-glazed coat (SouthWest)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.40	)		0.80		0.70 x 0.83		0.5
W3 Window - Double-glazed coat (SouthEast)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 0.99	)		0.80		0.70 x 0.83		0.4
W5 Window - Double-glazed coat (SouthEast)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 0.99	)		0.80		0.70 x 0.83		0.4
W7 Window - Double-glazec coat (SouthEast)	I, air-filled,	low-E, En=0	.1, soft	0.9 x 1.20	)		0.80		0.70 x 0.83		0.5
Window Double diazor	air filled	low E En-0	1 soft	00 v 1 /(	ı		0.80		070 v 0.83		05

(83-1)

(83)

(84)

Window - Double-glazed, air-filled, low-E, En=0.1, soft 0.9 x 1.40 coat (SouthWest)

W4

0.80

0.70 x 0.83

0.59

Lighting calculations				
	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.1, soft	0.9 x 1.29	0.80	0.70 x 0.83	0.54
coat (NorthEast)				
W8				
Window - Double-glazed, air-filled, low-E, En=0.1, soft	0.9 x 0.62	0.80	0.70 x 0.83	0.26
coat (NorthEast)				
W9				
GL = 4.47 / 50.49 = 0.089				
C1 = 0.500				
$C_{2} = 0.062$				

C2 = 0.962FI = 234

ΕI	=	234	

-		onsiveness										-
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												_
61.91	62.06	62.20	62.87	63.00	63.59	63.59	63.71	63.36	63.00	62.74	62.47	
alpha												
5.13	5.14	5.15	5.19	5.20	5.24	5.24	5.25	5.22	5.20	5.18	5.16	]
Utilisation	factor for ga	ains for living	area	<u>.</u>								-
0.99	0.98	0.96	0.90	0.76	0.58	0.42	0.46	0.71	0.93	0.99	1.00	7
Mean inte	ernal tempera	ature in living	g area T1		1	<u>I</u>			1			-
19.95	20.15	20.41	20.71	20.90	20.98	21.00	21.00	20.95	20.69	20.26	19.91	7
Temperat	ure during h	eating period	ls in rest of	dwelling Th2	2			][	<u> </u>			_
19.98	19.99	19.99	20.00	20.00	20.01	20.01	20.01	20.00	20.00	20.00	19.99	]
Utilisation	factor for ga	ains for rest of	of dwelling		JL	1L	_1	][	][	1L	!	_
0.99	0.98	0.95	0.87	0.70	0.49	0.33	0.37	0.62	0.90	0.98	0.99	٦
Mean inte	ernal tempera	iture in the r	est of dwellir	ng T2								_
18.60	18.89	19.27	19.67	19.91	20.00	20.01	20.01	19.97	19.66	19.06	18.55	٦
	ea fraction (2	6.09 / 50.49	)									).52
•	ernal tempera		-	ling)								
19.30	19.54	19.86	20.21	20.42	20.51	20.52	20.52	20.48	20.19	19.68	19.25	7
Apply adj	ustment to th	ne mean inte	ernal tempera	ature, where	appropriate			]				
19.30	19.54	19.86	20.21	20.42	20.51	20.52	20.52	20.48	20.19	19.68	19.25	٦
						[						_
8. Space	heating requ	uirement										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]
Utilisation	factor for ga	ains				1	A				R	_
0.99	0.98	0.95	0.87	0.73	0.54	0.38	0.42	0.66	0.91	0.98	0.99	1
Useful ga	ains		1		]				1			_
383.39	450.81	496.18	504.54	445.62	319.23	215.21	225.24	334.43	401.89	378.71	361.14	7
Monthly a	average exte	ernal tempera	ature									_
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	7
	rate for mea											
849.44	827.13	753.04	630.56	485.51	325.61	216.03	226.63	352.84	533.74	702.98	844.94	7
	of month for											
1.00	1.00	1.00	1.00	1.00	-	-	1.	-	1.00	1.00	1.00	7
	ating require											
346.74	252.89	191.10	90.74	29.68	-	-		-	98.10	233.47	359.95	٦
	1 / 7 / XV	I I Y I I U										

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

Total space heating requirement per year (kWh/year) (October to May)

1602.66

31.74

(98)

(99)

9a. Energy requirements									kWh/year	
No secondary heating systen Fraction of space heat from r Efficiency of main heating sy	nain system(s)					G	1.0000 93.40%		KWWyCa	(
Jan Feb Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement										
346.74 252.89 191.	0 90.74	29.68	-	-	-	-	98.10	233.47	359.95	(
Appendix Q - monthly energy	saved (main he	ating system	<u>ו</u> 1)				Į	<u>I</u>		
0.00 0.00 0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(
Space heating fuel (main hea	ing system 1)									
371.24 270.76 204.	97.15	31.77	-	-	-	-	105.03	249.97	385.39	(
Appendix Q - monthly energy	saved (main he	ating system	ן 1 2)	I						
0.00 0.00 0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(.
Space heating fuel (main hea	ing system 2)						1L	<u>I</u>		
0.00 0.00 0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(
Appendix Q - monthly energ	saved (seconda	ary heating	system)	R			Ų	ņ		
0.00 0.00 0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(.
Space heating fuel (secondar	/)		_1				I(			
0.00 0.00 0.00	0.00	0.00	-	-		-	0.00	0.00	0.00	(
Water heating Water heating requirement				JL			][	H		
163.69 142.99 148.	7 131.95	127.75	112.52	107.80	120.17	121.50	138.35	147.69	159.85	(
Efficiency of water heater									80.30	(.
86.90 86.47 85.6	84.13	82.03	80.30	80.30	80.30	80.30	84.20	86.20	87.03	(.
Water heating fuel						I				
188.38 165.36 173.	53 156.84	155.74	140.12	134.25	149.65	151.31	164.31	171.33	183.66	(.
Annual totals							I	<u> </u>	kWh/year	
Space heating fuel used, mai	n system 1								1715.91	()
Space heating fuel (secondar	,								0.00	(
Water heating fuel									1934.58	(.
Electricity for pumps, fans an	l electric keep-ho	t								,
central heating pump boiler with a fan-assisted flu									30.00	(
Total electricity for the above									45.00 75.00	(
Electricity for lighting (100.009	2								234.33	(
Energy saving/generation tec Appendix Q -										,
Energy saved or generated	0:								0.000	(
Energy used ():									0.000	(
Total delivered energy for all	uses								3959.81	(

10a. Does not apply

11a. Does not apply

#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	1715.91	0.216	370.64	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1934.58	0.216	417.87	(264)
Space and water heating			788.51	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	234.33	0.519	121.62	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			949.05	(272)
			kalm <sup>2</sup> hoor	

	kg/m²/year	
Emissions per m <sup>2</sup> for space and water heating	15.62	(272a)
Emissions per m <sup>2</sup> for lighting	2.41	(272b)
Emissions per m <sup>2</sup> for pumps and fans	0.77	(272c)
Target Carbon Dioxide Emission Rate (TER)	18.80	(273)

 $= (15.6171 \times 1.00) + 2.4087 + 0.7709$ 



#### Project Information Building type Top-floor flat

Reference Date	9913 15 April 2020		
Client	GBS Architectural Design Lombard Business Park 8 Lombard Road Wimbledon SW19 3TZ	Project	Flat 5 130 Chalton Street London NW1 1RX

## **EPS** Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

	0						Area (m²)		Av. Storey height (m)		Volume (m³)		
	other floors						68.84		2.40		165.	22	(3a)
Total floor Dwelling v	area olume (m <sup>3</sup> )						68.84				165.:	22	(4) (5)
2. Ventilati	tion rate										m³ ı	per hou	r
							main + seon	dary + othe	er				
							heating						
	f chimneys						0 + 0 + 0		x 40			0.00	()
	open flues	f					0 + 0 + 0		x 20			0.00	(***)
	intermittent						2 0		x 10 x 10			20.00 0.00	. ,
	f passive ve flueless gas						0		x 10 x 40			0.00	( )
	nucicss gas	5 11105					0		X 10			0.00	5 (70)
											Air	change	s per hour
Infiltration of	due to chimr	neys, fans ar	nd flues									0.12	2 (8)
Pressure te	est, result q	50							5.00				(17)
Air permea	2											0.37	( - )
		hich sheltere	d									1.00	( )
Shelter fact												0.93	. ,
		ating shelter										0.34	4 (21)
		I for monthly	-	~	- )r	-16		- Y	10				
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
	_!	_I	]						I		I	52.50	) (22)
Wind Facto	or												
1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18		
											l	13.13	3 (22a)
Adjusted in	filtration rate	e (allowing fo	r shelter and	d wind spee	d)								. ,
0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.40		
		<u>I</u>	J			<u>I</u>			][			4.50	) (22b)
Ventilation	: natural ver	ntilation, inter	mittent extra	ct fans									
Effective ai	ir change ra	te											
0.60	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
L													

#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat los	sses and hea	at loss parai.	neter											
Element		Gross	Oper	nings	Net area		U-value		ΑxU					
\\/indow	Daubla aları	area, m <sup>2</sup>	m²		A, m <sup>2</sup>	F.0.	W/m <sup>2</sup> K		W/K	1 1 0				(27)
	Double-glaze =0.1, soft co		t)		3.15	50	1.33 (1.40)		2	1.18				(27)
W4	-0.1, SUIL CU	at (NUTTILAS	()											
	Double-glaze	ed, air-filled,			0.84	40	1.33 (1.40)	)	-	1.11				(27)
	=0.1, soft co		t)											( )
W5														
Window -	Double-glaze	ed, air-filled,			1.89	90	1.33 (1.40)	)	2	2.51				(27)
	=0.1, soft co	at (NorthEas	t)											
W7														(07)
	Double-glaze		a.t.)		1.2	50	1.33 (1.40)	)		1.66				(27)
W3	=0.1, soft coa	at (Southwes	Sl)											
	Double-glaze	ed air-filled			1.2	50	1.33 (1.40)	1		1.66				(27)
	=0.1, soft coa		st)		1.23	50	1.55 (1.40)	,		1.00				(27)
W2			· · /											
Window -	Double-glaze	ed, air-filled,			1.2	50	1.33 (1.40)	)	1	1.66				(27)
low-E, En=	=0.1, soft coa	at (SouthWe	st)											
W1														
	- Double-gla				1.94	40	1.0	0	Î	1.94				(26)
	=0.1, soft co	at (NorthEas	t)											
Entrance Walls	e Door				83.:	25	0.1	0	1,	1.99				(29)
External	Wall				03	20	0.1	0	14	+.77				(29)
Walls					13.	77	0.1	8	-	2.48				(29)
Seperati	ing Wall to U	Inheated Cor	ridor											
Flat roofs					64.	34	0.1	3	8	3.36				(30)
Pitched roo	ofs insulated	between raf	ters		6.2	21	0.1	3	(	).81				(30)
Total area	of external	elements Sia	ma A. m²										179.14	(31)
	at loss, W/K	J											41.34	(33)
Thermal m	nass parame	eter, kJ/m²K	(user-specifie	ed TMP)								4	250.00	(35)
Effect of th	nermal bridge	es											8.96	(36)
Total fabric													50.30	(37)
	heat loss ca		-	·										
32.48	32.28	32.08	31.15	30.97	30.16	30.1	6 30.0	1	30.47	30.97	31.33	31.69		(38)
Heat transf	fer coefficien	t, W/K												
82.78	82.58	82.38	81.45	81.27	80.46	80.4	6 80.3	1	80.77	81.27	81.63	82.00		
													81.45	(39)
	parameter (H													
1.20	1.20	1.20	1.18	1.18	1.17	1.17	1.17		1.17	1.18	1.19	1.19		
HLP (aver													1.18	(40)
	f days in mo	-	-	·						1				
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug		Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31		30	31	30	31		
										~ ~				

CAD	2012 warkshaath	an mational	disco Ilino a	anlaulation	afternat emploaterna	
SAP	2012 WORKSHEELII	n nononai	awenna -	Calculation	of target emissions	

	<i>eating energ</i> occupancy,		ents								kWh/yea 2	r .22
	erage hot wa		n litres per d	lay Vd,avera	ige						86	.87
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]
Hot water i	usage in litre	s per day fo	or each mont	h		,г			Л			1
95.56	92.08	88.61	85.13	81.66	78.18	78.18	81.66	85.13	88.61	92.08	95.56	]
Energy cor	ntent of hot w	vater used				I						1
141.71	123.94	127.89	111.50	106.99	92.32	85.55	98.17	99.34	115.77	126.38	137.24	]
Energy cor Distribution	ntent (annual i loss	)		л			Р.				1366	.79
21.26	18.59	19.18	16.72	16.05	13.85	12.83	14.73	14.90	17.37	18.96	20.59	]
Hot water /olume fac Femperatu	re factor t from store	factor (kWI	h/day)								0.00 0.00 0.00	000
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	]
Vet storage	e loss	JLJ			_II	][			][			1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
Primary lo	uss	JL	_![			IL		I	IL	I		1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	]
Combi loss	s calculated 1	for each mo	nth	]				][				1
48.69	42.38	45.15	41.98	41.61	38.56	39.84	41.61	41.98	45.15	45.41	48.69	]
Fotal heat	required for	water heatin	g calculated	for each mo	onth	I						1
190.40	166.32	173.04	153.48	148.60	130.88	125.39	139.78	141.32	160.93	171.78	185.93	]
Output from	n water heat	er for each	month, kWh/	month		Л						1
190.40	166.32	173.04	153.48	148.60	130.88	125.39	139.78	141.32	160.93	171.78	185.93	]
							R	л.			1887	.86
•	from water	پ ۲	1	1							1	1
59.29	51.80	53.81	47.57	45.98	40.34	38.41	43.04	43.53	49.78	53.37	57.80	]
5. Internal	gains											
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]
Vetabolic (	gains, Watts											
110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	]
ighting ga	ains											
18.61	16.53	13.44	10.18	7.61	6.42	6.94	9.02	12.11	15.38	17.95	19.13	]
Appliances	gains											_
194.57	196.59	191.51	180.67	167.00	154.15	145.56	143.55	148.63	159.47	173.14	185.99	
Cooking g	ains											_
34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	]
Pumps and	d fans gains											
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
osses e.g	g. evaporatio	n (negative	values)									_
-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	
Nater heat	ing gains											_
79.69	77.09	72.33	66.07	61.80	56.02	51.62	57.85	60.45	66.91	74.13	77.69	]
Fotal interr	nal gains											_
352.14	349.48	336.54	316.19	295.67	275.86	263.39	269.69	280.46	301.02	324.48	342.08	

SAP 2012 worksheet for notional dwelling - calculation of target emissions

6. Solar ga	ains (calcula	ation for Jan	uary)		Area 0 El			~ ^		Chodin a	Caina
Window - coat (North W4	-	ed, air-filled,	low-E, En=(	).1, soft	Area & Fli 0.9 x 3.15			g & FF 0.63 x 0.70		Shading ).77	Gains 10.861
	-	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 0.84	0 11.28		0.63 x 0.70	(	).77	2.896
	•	ed, air-filled,	low-E, En=(	).1, soft	0.9 x 1.89	0 11.28		0.63 x 0.70	(	).77	6.517
	-	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 1.25	0 36.79		0.63 x 0.70	(	).77	14.055
	-	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 1.25	0 36.79		0.63 x 0.70	(	).77	14.055
	-	ed, air-filled,	low-E, En=(	).1, soft	0.9 x 1.25	0 36.79		0.63 x 0.70	(	).77	14.055
	hEast)	azed, air-filleo	d, Iow-E, Er	=0.1, soft	0.9 x 1.94	0 0.00		0.63 x 0.70	(	).77	0.000
	r gains, Jan	uary									62.4
Solar gain				7							
62.44	113.10	172.63	243.89	300.54	310.41	294.25	250.15	197.02	129.82	76.02	52.64
Total gains	- r	1	1	1		1	1		1	1	
414.59	462.58	509.18	560.07	596.21	586.27	557.64	519.83	477.48	430.84	400.50	394.72
Lighting c	calculations										
					Area			g		F x Shading	
Window - coat (North W4	•	ed, air-filled,	low-E, En=(	).1, soft	0.9 x 3.15	•		0.80	(	).70 x 0.83	1.3
	0	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 0.84	ļ		0.80	(	0.70 x 0.83	0.3
Window - coat (North	-	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 1.89	)		0.80	(	0.70 x 0.83	0.7
coat (Sout	-	ed, air-filled,	low-E, En=0	).1, soft	0.9 x 1.25	i		0.80	(	0.70 x 0.83	0.5
coat (Sout	•	ed, air-filled,	low-E, En=(	).1, soft	0.9 x 1.25	i		0.80	(	0.70 x 0.83	0.5
W2 Window - coat (South W1	-	ed, air-filled,	low-E, En=€	).1, soft	0.9 x 1.25	i		0.80	(	).70 x 0.83	0.5
	/ 68.84 = 0. 0	059									

C2 = 1.030

EI = 329

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3u		IVIAI	Дрі	liviay	Jun	Jui	Aug	Jeh	001		Dec
57.75	57.89	58.03	58.69	58.82	59.41	59.41	59.53	59.18	58.82	58.57	58.30
lpha	57.07	50.05	30.07	30.02	57.41	37.41	57.55	57.10	30.02	50.57	50.50
4.85	4.86	4.87	4.91	4.92	4.96	4.96	4.97	4.95	4.92	4.90	4.89
		nins for living		1.72	4.70	4.70	4.77	4.75	4.72	4.70	4.07
1.00	1.00	0.99	0.97	0.91	0.77	0.61	0.67	0.89	0.98	1.00	1.00
		iture in living	_		0.77	0.01	0.07	0.07	0.70	1.00	1.00
19.69	19.83	20.07	20.40	20.71	20.92	20.98	20.97	20.82	20.43	20.00	19.67
		eating periods				20.70	20.77	20.02	20.10		17.07
19.92	19.92	19.92	19.93	19.94	19.95	19.95	19.95	19.94	19.94	19.93	19.93
Jtilisation f		ins for rest o									1
1.00	0.99	0.99	0.96	0.88	0.68	0.48	0.54	0.83	0.97	0.99	1.00
lean inter	nal tempera	ture in the re	est of dwellin	iq T2							
18.18	18.38	18.73	19.22	19.64	19.89	19.94	19.93	19.79	19.26	18.64	18.15
iving area	fraction (2	6.80 / 68.84)									0
lean inter	nal tempera	ture (for the	whole dwell	ing)							
18.77	18.94	19.25	19.68	20.06	20.29	20.34	20.34	20.19	19.71	19.17	18.74
pply adjust	stment to th	ne mean inter	nal tempera	ture, where	appropriate						
18.77	18.94	19.25	19.68	20.06	20.29	20.34	20.34	20.19	19.71	19.17	18.74
			][			]				]	
		. ,									
,	eating requ			1						- I	
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	actor for ga						0.50				
1.00	0.99	0.98	0.96	0.88	0.72	0.53	0.59	0.84	0.97	0.99	1.00
Jseful gair		1	1	1		1	1	1	1		1
413.00	459.37	501.34	536.11	524.93	419.56	294.51	305.13	402.96	417.79	397.61	393.53
		rnal tempera	- 1(	- <b>Y</b>							
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
	· ·	n internal ter		- Y							
1197.59	1159.42	1050.30	877.89	679.39	457.65	301.20	316.17	491.89	740.78	985.42	1192.35
raction of	month for h	neating									
1.00	1.00	1.00	1.00	1.00			1	1	1.00	1.00	1.00

 Space heating requirement for each month, kWh/month

 583.74
 470.44
 408.42
 246.08
 114.92
 240.30

 Total space heating requirement per year (kWh/year) (October to May)

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

3081.45 (98) 44.76 (99)

423.23

594.32

9a. Energ	y requiremen	nts									kWh/year	
No secon	dary heating	system sele	ected								www.yodi	
	f space heat		system(s)						1.0000			(202)
	of main heat	ting system							93.40%			(206)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space hea	ating requiren	nent										
583.74	470.44	408.42	246.08	114.92	-	-	-	-	240.30	423.23	594.32	(98)
Appendix	Q - monthly	energy save	ed (main he	ating syster	n 1)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space hea	ating fuel (ma	in heating s	ystem 1)									
624.98	503.68	437.29	263.47	123.04	-	-	-	-	257.28	453.14	636.32	(211)
Appendix	Q - monthly	energy save	ed (main he	ating system	n 2)						A	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space hea	ating fuel (ma	in heating s	ystem 2)			JL			1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix	Q - monthly	energy sav	red (seconda	ary heating	system)	. Д			1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space hea	ating fuel (se	condary)	][						][]			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water hear	ting	1			][		_!	I	1			
Water hea	iting requirem	ent										
190.40	166.32	173.04	153.48	148.60	130.88	125.39	139.78	141.32	160.93	171.78	185.93	(64)
Efficiency	of water hea	ter		. н.							80.3	0 (216)
87.69	87.52	87.14	86.23	84.41	80.30	80.30	80.30	80.30	86.06	87.23	87.77	(217)
Water hear	ting fuel								1			
217.14	190.03	198.59	177.98	176.04	162.98	156.15	174.07	176.00	187.00	196.93	211.84	(219)
Annual tot						,п			I		kWh/year	
	ating fuel use	d, main sys	item 1								3299.2	0 (211)
-	ating fuel (se	-									0.0	0 (215)
Water hear	•										2224.7	4 (219)
2	for pumps, fa	ans and elec	ctric keep-ho	ot							20.0	
	ieating pump th a fan-assis	tod fluo									30.0 45.0	``
	tricity for the		h/vear								45.0	
	for lighting (1		-								328.7	. ,
	aving/generati											. ,
Appendix												
	saved or ger	nerated ():									0.00	•
Energy	used ():										0.00	0 (237a
Total deliv	vered energy	for all uses									5927.6	4 (238)
												(====)

10a. Does not apply

11a. Does not apply

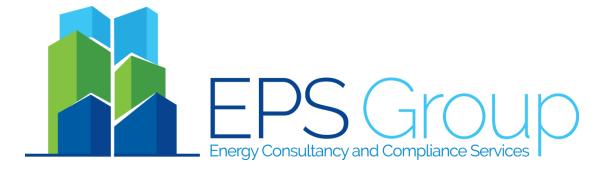
#### SAP 2012 worksheet for notional dwelling - calculation of target emissions

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	3299.20	0.216	712.63	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2224.74	0.216	480.54	(264)
Space and water heating			1193.17	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	328.71	0.519	170.60	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1402.69	(272)
			ka/m²/vear	

	kg/m²/year
Emissions per m <sup>2</sup> for space and water heating	17.33 (272a)
Emissions per m <sup>2</sup> for lighting	2.48 (272b)
Emissions per m <sup>2</sup> for pumps and fans	0.57 (272c)
Target Carbon Dioxide Emission Rate (TER)	20.38 (273)

 $= (17.3325 \times 1.00) + 2.4782 + 0.5654$ 



## Appendix 2:

Lean DER Calculations (SAP Derived)



#### Project Information Building type Mid-floor flat

Reference	9913		
Date	3 March 2020		
Client	GBS Architectural Design	Project	Flat 1
	Lombard Business Park		130 Chalton Street
	8 Lombard Road		London
	Wimbledon		NW1 1RX
	SW19 3TZ		

### **EPS** Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for New dwelling as built - calculation of dwelling emissions

1. Overall dwelling dimensions

Fourth and other floors       50.49       2.40       121.18       (3a)         Total floor area       50.49       (4)         Dwelling volume (m³)       121.18       (5)         2. Ventilation rate       m³ per hour
Dwelling volume (m³)       121.18       (5)         2. Ventilation rate       121.18       121.18
main + seondary + other
heating
Number of chimneys 0 + 0 + 0 x 40 0.00 (6a)
Number of open flues         0 + 0 + 0         x 20         0.00         (6b)
Number of intermittent fans2x 1020.00(7a)
Number of passive vents 0 x 10 0.00 (7b)
Number of flueless gas fires 0 x 40 0.00 (7c)
Air changes per hour
Infiltration due to chimneys, fans and flues 0.17 (8)
Pressure test, result q50 4.50 (17)
Air permeability 0.39 (18)
Number of sides on which sheltered 3.00 (19)
Shelter factor 0.78 (20)
Infiltration rate incorporating shelter factor 0.30 (21)
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
5.10         5.00         4.90         4.40         4.30         3.80         3.70         4.00         4.30         4.50         4.70
52.50 (22) Wind Factor
1.27 1.25 1.23 1.10 1.08 0.95 0.95 0.93 1.00 1.08 1.13 1.18
Adjusted infiltration rate (allowing for shelter and wind speed) (22a
0.39 0.38 0.37 0.33 0.32 0.29 0.29 0.28 0.30 0.32 0.34 0.36
3.97 (22)
Ventilation : natural ventilation, intermittent extract fans Effective air change rate
0.57 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.56 0.56 (25)

<i>3. Heat los</i> . Element	ses and hea	<i>t loss paran</i> Gross		enings	Net area		U-value	ΑxU		kappa-value	АхК	
		area, m²	m²		A, m²		W/m²K	W/K		kJ/m²K	kJ/K	
Window - D	Double-glazed	d, argon fille	ed,		0.9	10	1.33 (1.40)		1.21			(27
	0.1, soft coa	t (NorthEast	t)									
W9												
	Double-glazed	-			1.8	90	1.33 (1.40)		2.51			(27
low-E, En=0 W8	0.1, soft coa	t (NorthEast	i)									
	Double-glazed D.1, soft coa	•			2.0	940	1.33 (1.40)		2.70			(27
	Double-glazed D.1, soft coa	-			1.7	'50	1.33 (1.40)		2.32			(27
	Double-glazed D.1, soft coa	-			1.4	50	1.33 (1.40)		1.92			(27
Window - D	Double-glazed D.1, soft coa	•			1.4	50	1.33 (1.40)		1.92			(27
Window - D	Double-glazed D.1, soft coa	•			2.0	)40	1.33 (1.40)		2.70			(27
Window - D	Double-glazed D.1, soft coa	-			2.0	40	1.33 (1.40)		2.70			(27
Window - D	Double-glazed D.1, soft coa	-			2.0	40	1.33 (1.40)		2.70			(27
Solid door Entrance	Door				1.9	40	0.66		1.28			(26
Walls					38	.46	0.22		8.46	60.00	2307.60	(29
External Walls	vvali				10	.73	0.22		2.36	0.00	0.00	(29
	ig Wall to Ur	heated Cor	ridor		10	.15	0.22		2.30	0.00	0.00	(29
Party wall					9	.38	0.00		0.00	70.00	656.60	
Total area (	of external e	lements Sia	maΔ m²								66.74	(31
Fabric heat		ionionito olg	ind <i>r</i> , in								32.80	•
	ass paramet	er, kJ/m²K	(user-speci	fied TMP)							250.00	
	ermal bridges										9.62	
Total fabric	heat loss										42.42	2 (37
Ventilation	heat loss ca	lculated mor	nthly									
22.96	22.85	22.74	22.20	22.11	21.64	21.64	21.56	21.82	22.11	22.31	22.52	(38
Heat transfe	er coefficient,	W/K	11					JL		JI		
65.39	65.27	65.16	64.63	64.53	64.06	64.06	63.98	64.24	64.53	64.73	64.94	
		J					I	]			64.63	(39
	arameter (H		1 20	1 20	1 27	1 07	1 17	1 07	1 00	1 20	1.29	
1.30	1.29	1.29	1.28	1.28	1.27	1.27	1.27	1.27	1.28	1.28		//0
HLP (avera Number of	ige) days in mor	th (Table 1a	a)								1.28	3 (40
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Juli												

	<i>heating energ</i> occupancy,		pents								kWh/year 1.70
	verage hot wa		n litres per	day Vd,aver	age						74.68
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ot water	usage in litre	es per day f	or each moi	nth	][			]			
32.15	79.16	76.18	73.19	70.20	67.21	67.21	70.20	73.19	76.18	79.16	82.15
nergy co	ontent of hot	water used	N		]			]			
121.83	106.55	109.95	95.86	91.98	79.37	73.55	84.40	85.41	99.53	108.65	117.98
nergy co istributior	ontent (annua n loss	al)			/	H		N	H	R	1175.05
18.27	15.98	16.49	14.38	13.80	11.91	11.03	12.66	12.81	14.93	16.30	17.70
store lo	ss determine	d from EN 1	13203-2 test	s, taken fron	n boiler data	record				I	
	storage volu	, ,									0.00
	cylinder los	s factor (kW	/h/day)								0.0000
olume fa emperati	ure factor										0.0000 0.0000
	st from store	(kWh/day)									0.00
otal stora											
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
et storag	ge loss	л	n	A	- J.		ri			л	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rimary lo	055				1	1		I	I		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ombi los	s calculated	for each mo	onth					J	][	I	
3.05	2.75	3.05	2.95	3.05	2.95	3.05	3.05	2.95	3.05	2.95	3.05
otal heat	t required for	water heatir	ng calculated	d for each m	ionth			]			
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03
utput fro	m water hea	ter for each	month, kWh	n/month	]	JL		J			
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03
			Л					J	][	I	1210.91
eat gains	s from water	heating, kW	/h/month								
41.27	36.12	37.32	32.61	31.34	27.13	25.22	28.82	29.13	33.86	36.86	39.99
Interna	al nains										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	gains, Watts		7.61		5411	501			001		Dee
35.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23
ighting g		00.20	00.20		00.20	00.20	00.20	00.20	00.20	00.20	00.20
13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.42	8.61	10.94	12.76	13.61
ppliances		7.50	7.24	0.11	4.07	4.74	0.42	0.01	10.74	12.70	13.01
148.51	150.05	146.16	137.90	127.46	117.65	111.10	109.56	113.44	121.71	132.15	141.95
ooking		140.10	137.70	127.40	117.05	111.10	107.50	113.44	121.71	132.13	141.75
31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52
	a fans gains		51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	.g. evaporatio			3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	- ·	-		60.10	60.10	40.10	60.10	60.10	60.10	60.10	40.10
-68.18	-68.18 ating gains	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18
		E0 1/	45.00	40.10	27.40	22.00	20.74	40.47	AE 51	E1 00	E2 7E
55.47	53.74	50.16	45.29	42.13	37.68	33.89	38.74	40.46	45.51	51.20	53.75
268.78	rnal gains	057.44	242.00	224 57	011.17	201 50	201 22	014.00	220.70	047 (0	2/0.00
	267.12	257.46	242.00	226.57	211.47	201.50	206.29	214.09	229.72	247.68	260.88

6. Solar ga	ains (calculati	ion for Janu	iary)		Area & Flu	x		g & FF		Shading	Gains	
Window - I coat (North W9	Double-glazec 1East)	l, argon fille	ed, Iow-E, I	En=0.1, soft				0.63 x 0.70		).77	3.1379	
	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.890	) 11.28		0.63 x 0.70	(	).77	6.5171	
	Double-glazec hWest)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.040	36.79		0.63 x 0.70	(	).77	22.9391	
	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.750	36.79		0.63 x 0.70	(	).77	19.6782	
Window - I coat (South W7	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.450	36.79		0.63 x 0.70	(	).77	16.3048	
Window - I coat (South W5	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.450	) 36.79		0.63 x 0.70	(	).77	16.3048	
Window - I coat (South W3	Double-glazec nWest)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.040	36.79		0.63 x 0.70	(	).77	22.9391	
Window - I coat (South W2	Double-glazec hWest)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.040	) 36.79		0.63 x 0.70	(	).77	22.9391	
Window - I coat (South W1	Double-glazec าWest)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.040	) 36.79		0.63 x 0.70	(	).77	22.9391	
Solid door Entrance Total solar	e Door gains, Janua	ary			0.9 x 1.940	0.00		0.00 x 0.70	(	).77	0.0000 153.70	(83-1)
Solar gains		-										
153.70	265.01	371.12	474.12	544.08	545.88	523.90	470.83	406.65	295.19	184.68	131.16	(83)
Total gains	5		N			1						
422.48	532.13	628.58	716.11	770.65	757.35	725.40	677.11	620.74	524.91	432.36	392.04	(84)
Lighting ca	alculations				Area			g		F x Shadin	n	
Window - I coat (North W9	Double-glazec 1East)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 0.91			0.80		0.70 x 0.83	0.38	
	Double-glazec 1East)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.89			0.80	(	0.70 x 0.83	0.79	
	Double-glazec 1West)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.04			0.80	(	0.70 x 0.83	0.85	
	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.75			0.80	(	0.70 x 0.83	0.73	
	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.45			0.80	(	0.70 x 0.83	0.61	
	Double-glazec nEast)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 1.45			0.80	(	0.70 x 0.83	0.61	
	Double-glazec hWest)	l, argon fille	ed, Iow-E, I	En=0.1, soft	0.9 x 2.04			0.80	(	0.70 x 0.83	0.85	
	Double-glazed	l, argon fille	ed, low-E, l	En=0.1, soft	0.9 x 2.04			0.80	(	0.70 x 0.83	0.85	

Window - Double-glazed, argon filled, low-E, En=0.1, soft 0.9 x 2. coat (SouthWest) W2

IPA Designer Version 6	03x SAP V	ersion 992	
icensed to EPS Group	.057 ; 574 1	0131011 7.72	

8c. Space cooling requirement - not applicable

		ure in living	area T1		1	ų	_^		U		A
Mean inter	rnal temperat	are in inning									
19.78	20.04	20.36	20.69	20.90	20.98	21.00	20.99	20.94	20.65	20.14	19.73
Temperatu	re during hea	ating periods	in rest of	dwelling Th2	2		A	J	I		А
19.84	19.85	19.85	19.86	19.86	19.87	19.87	19.87	19.86	19.86	19.85	19.85
Jtilisation	factor for gain	ns for rest o	f dwelling	A			A				A
0.99	0.97	0.93	0.82	0.64	0.44	0.29	0.33	0.57	0.87	0.98	0.99
Mean inter	rnal temperati	ure in the re	st of dwellir	ng T2	<b>,</b>			J	<u> </u>	R	А
18.76	19.01	19.33	19.63	19.80	19.86	19.86	19.87	19.84	19.60	19.12	18.71
0	a fraction (26 rnal temperat	,		lina)							
19.29	19.54	19.86	20.18	20.37	20.44	20.45	20.45	20.41	20.14	19.65	19.24
	istment to the										
19.14	19.39	19.71	20.03	20.22	20.29	20.30	20.30	20.26	19.99	19.50	19.09
8 Space	heating regul	irement									
		Л			[	1		л.	N		
	heating requi			Mau						Neu	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan Utilisation	Feb factor for gain	Mar									
Jan Utilisation 0.99	Feb factor for gain 0.97	Mar	Apr 0.82	May 0.66	Jun 0.47	Jul 0.33	Aug 0.37	Sep	Oct	Nov	Dec 0.99
Jan Utilisation 0.99	Feb factor for gain 0.97	Mar									
Jan Utilisation 0.99 Useful gai 417.11	Feb factor for gain 0.97 ns 514.75	Mar ns 0.92 580.13	0.82	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99
Jan Jtilisation 0.99 Jseful gai 417.11 Monthly a	Feb factor for gain 0.97 ns	Mar ns 0.92 580.13	0.82	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99
Jan Utilisation 0.99 Useful gai 417.11 Monthly ar 4.30	Feb factor for gai 0.97 ns 514.75 verage extern	Mar ns 0.92 580.13 nal temperat	0.82 589.95 ture 8.90	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99
Jan Utilisation 0.99 Useful gai 417.11 Monthly ar 4.30	Feb factor for gain 0.97 ns 514.75 verage extern 4.90	Mar ns 0.92 580.13 nal temperat	0.82 589.95 ture 8.90	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99
Jan Utilisation 0.99 Useful gai 417.11 Monthly a 4.30 Heat loss 970.16	Feb factor for gain 0.97 ns 514.75 verage extern 4.90 rate for mean	Mar 10.92 580.13 10.92 580.13 10	0.82 589.95 ture 8.90 nperature	0.66	0.47 357.95 14.60	0.33 236.11 16.60	0.37	0.61	0.88 459.66 10.60	0.97 420.47 7.10	0.99 388.35 4.20
Jan Jtilisation 0.99 Jseful gai 417.11 Monthly a 4.30 Heat loss 970.16 Fraction of	Feb         factor for gain         0.97         ns         514.75         verage extern         4.90         rate for mean         945.98	Mar 10.92 580.13 10.92 580.13 10	0.82 589.95 ture 8.90 nperature	0.66	0.47 357.95 14.60	0.33 236.11 16.60	0.37	0.61	0.88 459.66 10.60	0.97 420.47 7.10	0.99 388.35 4.20
Jan Utilisation 0.99 Useful gai 417.11 Monthly a 4.30 Heat loss 970.16 Fraction of 1.00	Feb factor for gain 0.97 ns 514.75 verage extern 4.90 rate for mear 945.98 i month for her	Mar 10.92 580.13 10.92 580.13 10.00 1.00	0.82 589.95 ture 8.90 operature 719.35	0.66 510.77 11.70 549.62 1.00	0.47 357.95 14.60	0.33 236.11 16.60	0.37	0.61	0.88 459.66 10.60 606.01	0.97 420.47 7.10 802.37	0.99 388.35 4.20 966.73

Heating system responsiveness

Apr

54.25

4.62

0.86

Мау

54.34

4.62

0.71

Jun

54.73

4.65

0.53

Jul

54.73

4.65

0.39

Aug

54.80

4.65

0.43

Sep

54.58

4.64

0.66

Oct

54.34

4.62

0.91

Nov

54.17

4.61

0.98

7. Mean internal temperature

Mar

53.81

4.59

0.94

Temperature during heating periods in the living area, Th1 (°C)

GL = 6.53 / 50.49 = 0.129

W1

Feb

53.72

4.58

0.98

Utilisation factor for gains for living area

EI = 234

Jan

alpha 4.57

0.99

tau 53.62 0.85

21.00

1.00

Dec

53.99

4.60

0.99

(85)

(86)

9a. Energy	v requiremei	nts									kWh/year	
No second	lary heating	system sel	ected								KWII/yeai	
	space heat		system(s)						1.0000			(202)
	of main heat			1		- I			90.50%	<b>.</b>		(206)
Jan Crease has	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	ting requiren	1										(2.2)
411.47	289.79	208.80	93.17	28.91	-	-	-	-	108.88	274.97	430.32	(98)
	Q - monthly				m 1)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space hea	ting fuel (ma	-	system 1)									
454.66	320.21	230.72	102.95	31.94	-	-	-	-	120.31	303.83	475.49	(211)
Appendix (	Q - monthly	energy save	ed (main he	eating system	m 2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space hear	ting fuel (ma	in heating s	system 2)					·				
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix (	Q - monthly	energy sav	red (second	ary heating	system)	<u>п</u>			N			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space hea	iting fuel (se	condary)										
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heat	ing				J		I	J	][	I		
Water heat	ting requirem	ent										
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03	(64)
Efficiency of	of water hea	ter		R		1	R	я		R	87.30	) (216)
89.73	89.60	89.35	88.82	88.03	87.30	87.30	87.30	87.30	88.92	89.55	89.78	(217)
Water heat	ing fuel											
139.16	121.99	126.47	111.24	107.95	94.29	87.74	100.16	101.21	115.36	124.61	134.81	(219)
Annual tota	als		_, <b></b>								kWh/year	
	ting fuel use	d, main sys	tem 1								2040.11	1 (211)
-	iting fuel (se	-									0.00	) (215)
Water heat	•										1364.99	9 (219)
	for pumps, fa	ans and ele	ctric keep-ho	ot							20.00	(220-
	eating pump h a fan-assis	tod fluo									30.00 45.00	•
	ricity for the		h/vear								45.00	
	for lighting (1		-								233.81	
	ving/generati											
Appendix (	2 -											
	saved or gei	nerated ():									0.000	•
Energy	used ():										0.000	) (237a
Total delive	ered energy	for all uses									3713.91	1 (238)

10a. Does not apply

11a. Does not apply

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	2040.11	0.216	440.66	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1364.99	0.216	294.84	(264)
Space and water heating			735.50	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	233.81	0.519	121.35	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			895.78	(272)
			ka/m²/voar	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 17.74 (273)



#### Project Information Building type Top-floor flat

Reference Date	9913 15 April 2020		
Client	GBS Architectural Design	Project	Flat 5 - Lean
Clicit	Lombard Business Park	Појссі	130 Chalton Street
	8 Lombard Road		London
	Wimbledon		NW1 1RX
	SW19 3TZ		

### **EPS** Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for New dwelling as built - calculation of dwelling emissions

1. Overall dwelling dimensions

Fourth an Total floor	d other floors r area volume (m³)						Area (m²) 68.84 68.84		Av. Storey height (m) 2.40		Volume (m <sup>3</sup> ) 165.2 165.2		(3a) (4) (5)
2. Ventila	ation rate												_
							main + seo	ndary + oth	er		m, b	er hou	r
							heating	nuary + our	CI				
Number of	of chimneys						0 + 0 + 0		x 40			0.00	) (6a)
	of open flues						0 + 0 + 0		x 20			0.00	. ,
Number o	of intermittent	fans					2	2	x 10			20.00	) (7a)
Number of	of passive ve	ents					C	)	x 10			0.00	) (7b)
Number o	of flueless ga	s fires					C	)	x 40			0.00	) (7c)
											Air o	hange	s per hour
Infiltration	due to chim	neys, fans an	nd flues									0.12	
	test, result q								4.50				(17)
Air perme												0.3	
-	-	hich sheltere	d									1.00	
Shelter fa	ctor											0.93	3 (20)
Infiltration	rate incorpor	ating shelter	factor									0.32	2 (21)
Infiltration	rate modified	d for monthly	wind speed										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
Wind Fac	tor							1				52.50	) (22)
1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18		
			<u> </u>								]	13.13	3 (22a)
Adjusted	infiltration rate	e (allowing fo	r shelter and	d wind speed	d)								
0.41	0.40	0.39	0.35	0.34	0.30	0.30	0.30	0.32	0.34	0.36	0.38		
	n : natural ve air change ra	ntilation, inter te	mittent extra	ict fans								4.20	) (22b)
0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
	R	_л											

<i>3. Heat los</i> Element	sses and he	<i>at loss paran</i> Gross		enings	Net area		U-value	ΑxU		kappa-value	АхК	
		area, m <sup>2</sup>	m²		A, m²		W/m²K	W/K		kJ/m²K	kJ/K	
	-	ed, argon fille			1.2	50	1.33 (1.40)		1.66			(27)
	=0.1, soft co	at (SouthWes	st)									
W1	<b>D</b> 11 1				4.01	50	4 00 (4 40)					(07)
	-	ed, argon fille at (SouthWes			1.2	50	1.33 (1.40)		1.66			(27)
	Double-glaze	ed, argon fille	ed,		1.2	50	1.33 (1.40)		1.66			(27)
	0	at (SouthWes										
low-E, En=		ed, argon fille at (NorthEast			1.89	90	1.33 (1.40)		2.51			(27)
W7	Daubla alam	ad armon fills	a		0.0	10	1 22 (1 40)		1 1 1			(17)
	-	ed, argon fille at (NorthEasi			0.84	40	1.33 (1.40)		1.11			(27)
	Double-glaze	ed, argon fille	ed,		3.1	50	1.33 (1.40)		4.18			(27)
	-	at (NorthEast					. ,					. ,
W4												
Solid door					1.9	40	0.66		1.28			(26)
Entrance	e Door											
Walls External	Wall				83.	25	0.22		18.31	190.00	15817.50	(29)
Walls Seperati	ing Wall to L	Inheated Cor	ridor		13.	77	0.22		3.03	0.00	0.00	(29)
Flat roofs					64.	34	0.15		9.65	9.00	579.06	(30)
Pitched roo	ofs insulated	between raf	ters		6.	21	0.15		0.93	9.00	55.89	(30)
Tatal and	-f	demonstra Cira									170	14 (01)
	at loss, W/K	elements Sig	ma A, m²								179. 45.	( )
		eter, kJ/m²K	lusar spaci	fied TMD)							45. 100.	( )
	nermal bridge		(user-speci	neu nvn )							8.	. ,
Total fabric	0	53									54.	
		alculated mor	hthlv								54.	50 (57)
31.80	31.63	31.45	30.64	30.49	29.78	29.7	8 29.65	30.05	30.49	30.80	31.12	(38)
	fer coefficier		30.04	30.47	27.70	27.70	27.00	30.03	30.49	50.00	51.12	(50)
			1	1								
86.36	86.19	86.02	85.20	85.05	84.34	84.34	4 84.21	84.62	85.05	85.36	85.68	
Heat loss	parameter (I	HLP), W/m²K									85.	20 (39)
1.25	1.25	1.25	1.24	1.24	1.23	1.23	1.22	1.23	1.24	1.24	1.24	
HLP (aver	age)	_,	л		]	][		JL	<u> </u>	Л	1.	24 (40)
Number of	f days in mo	onth (Table 1a	a)									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	
			LĨ									

4. Water h	heating energ	ny requirem	ents								kWh/year
	occupancy,										2.2
Annual ave	erage hot wa	iter usage ii	n litres per d	ay Vd,avera	age						86.8
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
lot water	usage in litre	s per day fo	or each mont	h							
95.56	92.08	88.61	85.13	81.66	78.18	78.18	81.66	85.13	88.61	92.08	95.56
Energy cor	ntent of hot v	water used	1								
141.71	123.94	127.89	111.50	106.99	92.32	85.55	98.17	99.34	115.77	126.38	137.24
Energy co	ntent (annual	 I)	1		1						1366.79
Distribution	n loss										
21.26	18.59	19.18	16.72	16.05	13.85	12.83	14.73	14.90	17.37	18.96	20.59
store los	 ss determined	d from EN 1	3203-2 tests	taken from	boiler data	record					
Hot water	storage volu	me (litres)									0.0
	cylinder loss	factor (kW	h/day)								0.000
/olume fac											0.000
emperatu	re factor st from store	(W/Wb/day)									0.000
Total stora		(KWII/Udy)									0.0
0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vet storage		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	- Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary lo	- Y	1			-16						
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi loss	s calculated 1	for each mo	onth								
3.05	2.75	3.05	2.95	3.05	2.95	3.05	3.05	2.95	3.05	2.95	3.05
fotal heat	required for	water heatin	g calculated	for each me	onth					R	
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28
Dutput fror	m water heat	er for each	month, kWh/	month				I			
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28
											1402.6
leat gains	from water	heating, kW	'h/month								
47.88	41.90	43.29	37.81	36.33	31.43	29.21	33.40	33.77	39.26	42.76	46.39
				l							
5. Internal	l gains										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aetabolic g	gains, Watts		1								
110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88
ighting ga	ains	]						I	I	I	
18.61	16.53	13.44	10.18	7.61	6.42	6.94	9.02	12.11	15.38	17.95	19.13
Appliances	aains	]									
194.57	196.59	191.51	180.67	167.00	154.15	145.56	143.55	148.63	159.47	173.14	185.99
Cooking g		171.51	100.07	107.00	134.13	143.30	143.00	140.00	137.47	175.14	100.77
		24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09
	d fans gains										
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
osses e.q	g. evaporatio	n (negative	values)								
-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71
Vater heat	ting gains						<i>n</i>			л	
64.35	62.35	58.18	52.51	48.84	43.66	39.26	44.90	46.90	52.76	59.38	62.36
Total interr	nal gains					]I	_11		II		
336.81	334.74	322.39	302.63	282.71	263.50	251.03	256.73	266.91	286.87	309.73	326.74
		" OFF.J/	002.00	202.11	200.00	201.00	200.75	200.71	200.07	007.75	020.17

6. Solar gains	Icalculation	for Inniarial
0 SULAI UAILIS	((.all.1)/all()//	In Janual VI

6. Solar gains (calculation for January)				
	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W1	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W2	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest)	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
W3 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 1.890 11.28	0.63 x 0.70	0.77	6.5171
W7 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 0.840 11.28	0.63 x 0.70	0.77	2.8965
W5 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 3.150 11.28	0.63 x 0.70	0.77	10.8619
W4 Solid door	0.9 x 1.940 0.00	0.00 x 0.70	0.77	0.0000
Entrance Door Total solar gains, January				62.44 (83-1)
Solar gains				
62.44 113.10 172.63 243.89 300.54	310.41 294.25 250.1	5 197.02 129.8	76.02	52.64 (83)
Total gains	, , , , , , , , , , , , , , , , , , ,		,,	
399.25         447.83         495.03         546.52         583.25	573.90 545.28 506.8	8 463.93 416.6	9 385.75	379.38 (84)
<i>Lighting calculations</i> Window - Double-glazed, argon filled, low-E, En=0.1, soft	Area 0.9 x 1.25	g 0.80	FF x Shading 0.70 x 0.83	0.52
coat (SouthWest) W1				
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W2	0.9 x 1.25	0.80	0.70 x 0.83	0.52
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W3	0.9 x 1.25	0.80	0.70 x 0.83	0.52
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 1.89	0.80	0.70 x 0.83	0.79
W7 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 0.84	0.80	0.70 x 0.83	0.35
W5				
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) W4	0.9 x 3.15	0.80	0.70 x 0.83	1.32

C2 = 1.030

EI = 329

	Feb	Mar	Apr	May	lun	Jul	A.u.a	Sep	Oct	Nov	Dee
Jan au	Feb	war	Apr	Мау	Jun	Jui	Aug	Sep	Oci	NOV	Dec
22.14	22.19	22.23	22.44	22.48	22.67	22.67	22.71	22.60	22.48	22.40	22.32
alpha	22.17	22.25	22.44	22.40	22.07	22.07	22.71	22.00	22.40	22.40	22.52
2.48	2.48	2.48	2.50	2.50	2.51	2.51	2.51	2.51	2.50	2.49	2.49
	factor for ga			]			1				
0.97	0.96	0.94	0.89	0.81	0.69	0.57	0.61	0.79	0.91	0.96	0.97
Mean inte	rnal tempera	ture in living	area T1								
18.36	18.60	19.03	19.63	20.20	20.64	20.85	20.81	20.45	19.73	18.94	18.31
Temperati	ure during he	eating period	s in rest of d	welling Th2	IL } -	I		][	<u> </u>	JÍ	
19.88	19.88	19.88	19.89	19.89	19.90	19.90	19.90	19.90	19.89	19.89	19.88
Utilisation	factor for ga	ins for rest c	f dwelling	л	н	Л	н	J.	)I	н	я
0.96	0.95	0.93	0.87	0.77	0.62	0.46	0.51	0.73	0.89	0.95	0.97
Mean inte	rnal tempera	ture in the re	est of dwelling	g T2	JL			л	JL	R	
17.47	17.71	18.14	18.73	19.27	19.67	19.83	19.81	19.52	18.84	18.06	17.43
•	a fraction (2										0.3
17.82	18.06	18.49	whole dwelli 19.08	19.64	20.05	20.23	20.20	19.88	19.18	18.41	17.77
			rnal temperat			20.23	20.20	19.00	19.10	10.41	17.77
	17.91	18.34	18.93	19.49	19.90	20.08	20.05	19.73	19.03	18.26	17.62
17 67	11.71	10.54	10.75	17.47	17.70	20.00	20.05	17.75	17.05	10.20	17.02
17.67				0							
17.67				-							
	heating requ	lirement									
	heating requ	<i>uirement</i> Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>8. Space .</i> Jan		Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>8. Space .</i> Jan	Feb	Mar	Apr 0.85	May 0.76	Jun 0.62	Jul 0.48	Aug 0.52	Sep 0.72	Oct 0.87	Nov 0.93	Dec 0.96
<i>8. Space .</i> Jan Utilisation 0.95	Feb factor for ga	Mar									
<i>8. Space .</i> Jan Utilisation 0.95	Feb factor for ga	Mar									
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92	Feb factor for ga 0.94 ins	Mar ins 0.91 448.83	0.85	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92	Feb factor for ga 0.94 ins 418.99	Mar ins 0.91 448.83	0.85	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8 Space</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30	Feb factor for ga 0.94 ins 418.99 average exte	Mar ins 0.91 448.83 mal tempera 6.50	0.85 464.89 ture 8.90	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space I.</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30	Feb factor for ga 0.94 ins 418.99 average exte 4.90	Mar ins 0.91 448.83 mal tempera 6.50	0.85 464.89 ture 8.90	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30 Heat loss 1154.41	Feb factor for ga 0.94 ins 418.99 average exte 4.90 rate for mea	Mar ins 0.91 448.83 rnal tempera 6.50 n internal ter 1018.42	0.85 464.89 ture 8.90 nperature	0.76	0.62 356.63 14.60	0.48 260.97 16.60	0.52	0.72 336.05 14.10	0.87 363.86 10.60	0.93 360.57 7.10	0.96 362.94 4.20

Total space heating requirement per year (kWh/year) (October to May)

280.70

163.74

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

471.71

576.22

423.78

8c. Space cooling requirement - not applicable

263.04

426.04

585.67

3190.90

46.35

(98)

(99)

9a. Energ	ny requiremen	nts									kWh/year	
No secon	dary heating	system sel	ected								Kvvii/yedi	
	of space heat		system(s)						1.0000 90.50%			(202)
	of main hea			Mari	1		A				Du	(206)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	ating requirer	- I-		1	1		-1				505 (3	(00)
576.22	471.71	423.78	280.70	163.74	-	-	-	-	263.04	426.04	585.67	(98)
	Q - monthly		-1		m 1)							(0.1.0)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
-	ating fuel (ma	-	-						10			
636.70	521.23	468.26	310.16	180.93	-	-	-	-	290.65	470.76	647.15	(211)
	Q - monthly		-1		m 2)	Ir			1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space hea	ating fuel (ma	ain heating s	system 2)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix	Q - monthly	energy sav	ved (second	ary heating	system)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214
Space hea	ating fuel (se	econdary)										
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water hear								·				
Water hea	ating requirem	ient										
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28	(64)
Efficiency	of water hea	iter									87.30	•
89.84	89.80	89.72	89.55	89.19	87.30	87.30	87.30	87.30	89.48	89.73	89.86	(217)
Water hear	iting fuel											
161.12	141.07	145.94	127.80	123.37	109.13	101.48	115.94	117.17	132.79	144.12	156.10	(219)
Annual tot	tals	_л									kWh/year	
-	ating fuel use	-	tem 1								3525.85	· · ·
-	ating fuel (se	econdary)									0.00	•
Water hear	for pumps, fa	ans and ele	ctric keen-ho	ht							1576.04	4 (219)
-	neating pump										30.00	0 (230
boiler wit	ith a fan-assis	sted flue									45.00	0 (230
	tricity for the		2								75.00	•
	for lighting (										328.71	1 (232)
Appendix	aving/generat 0 -		Julie2									
	saved or ge	nerated ():									0.000	) (236
	used ():	v									0.000	
Total deliv	vered energy	for all uses									5505.60	0 (238)

10a. Does not apply

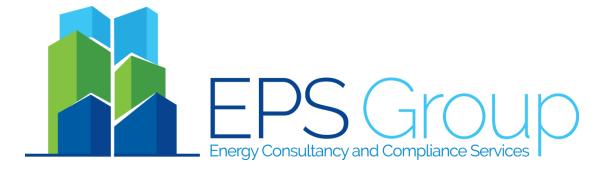
11a. Does not apply

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	3525.85	0.216	761.58	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1576.04	0.216	340.43	(264)
Space and water heating			1102.01	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	328.71	0.519	170.60	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1311.53	(272)
			1 / 2/	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 19.05 (273)



## Appendix 3:

**Proposed Green DER Calculations (SAP Derived)** 



#### Project Information Building type Mid-floor flat

Reference Date	9913 15 April 2020		
Client	GBS Architectural Design Lombard Business Park 8 Lombard Road Wimbledon SW19 3TZ	Project	Flat 1 - Green 130 Chalton Street London NW1 1RX

### **EPS** Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for New dwelling as built - calculation of dwelling emissions

1. Overall dwelling dimensions

Fourth and other floors       50.49       2.40       121.18       (3a)         Total floor area       50.49       (4)         Dwelling volume (m³)       121.18       (5)         2. Ventilation rate       m³ per hour	b) a) b)
Dwelling volume (m³)       121.18       (5)         2. Ventilation rate       121.18       121.18	b) a) b)
	b) a) b)
	b) a) b)
main + seondary + other	b) a) b)
heating	b) a) b)
Number of chimneys 0 + 0 + 0 x 40 0.00 (6	a) b)
Number of open flues         0 + 0 + 0         x 20         0.00         (6	b)
Number of intermittent fans2x 1020.00(7)	
Number of passive vents         0         x 10         0.00         (7)	()
Number of flueless gas fires 0 x 40 0.00 (7	0)
Air changes per ho	ur
Infiltration due to chimneys, fans and flues 0.17 (8	
Pressure test, result q50 4.50 (1	7)
Air permeability 0.39 (1	8)
Number of sides on which sheltered 3.00 (1	
Shelter factor 0.78 (2	
Infiltration rate incorporating shelter factor 0.30 (2 Infiltration rate modified for monthly wind speed	1)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
5.10         5.00         4.40         4.30         3.80         3.70         4.00         4.30         4.70	
52.50 (2	2)
Wind Factor	,
1.27         1.25         1.23         1.10         1.08         0.95         0.93         1.00         1.08         1.13         1.18	
Adjusted infiltration rate (allowing for shelter and wind speed) 13.13 (2	2a)
0.39 0.38 0.37 0.33 0.32 0.29 0.29 0.28 0.30 0.32 0.34 0.36	
3.97 (2	2b)
Ventilation : natural ventilation, intermittent extract fans Effective air change rate	
0.57 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.56 0.56 (2	5)

<i>3. Heat loss</i> Element	es and nea	<i>TIOSS paran</i> Gross area, m²		nings	Net area A, m²		U-value W/m²K	A x W/K		kappa-value kJ/m²K	A x K kJ/K	
Window - Do	nubla alazar				A, III- 2.04		1.33 (1.40)	VV/N	2.70	KJ/III <sup>2</sup> N	KJ/ N	(2
low-E, En=0. W1	-	-			2.04	10	1.55 (1.40)		2.70			(2
Window - De	ouble-glazed	t, argon fille	ed.		2.04	10	1.33 (1.40)		2.70			(2
low-E, En=0. W2	-	-			2101				2.7.0			(-
Window - Do low-E, En=0. W3	-	-			2.04	10	1.33 (1.40)		2.70			(2
Window - Do low-E, En=0 W5	-	-			1.45	50	1.33 (1.40)		1.92			(2
Window - Do low-E, En=0 W7	-	-			1.45	50	1.33 (1.40)		1.92			(2
Window - Do low-E, En=0 W6	-	-			1.75	50	1.33 (1.40)		2.32			(2
Window - Do low-E, En=0 W4	•	•			2.04	10	1.33 (1.40)		2.70			(2
Window - Do low-E, En=0 W8	-	-			1.89	90	1.33 (1.40)		2.51			(2
Window - Do low-E, En=0	-	-			0.91	0	1.33 (1.40)		1.21			(2
W9		. (	,									
Solid door					1.94	10	0.66	)	1.28			(2
Entrance I	Door											
Walls					38.4	46	0.22	2	8.46	60.00	2307.60	(2
External V	Vall											-
Walls	r Wall to Lir	booted Cor	ridor		10.7	/3	0.2	2	2.36	0.00	0.00	(2
Party wall	j wali to ui	heated Corr	IUUI		9.3	38	0.0	)	0.00	70.00	656.60	
Total area o	f ovtornal o	lomonts Sia	maΔm <sup>2</sup>								64	.74 (3
Fabric heat		iements olgi	ina 70, m									
Thermal ma		er, kJ/m²K	(user-specifi	ed TMP)							250	
Effect of the	rmal bridges	5									ç	.62 (3
Total fabric I											42	.42 (3
Ventilation h	eat loss ca	lculated mor	nthly									
22.96	22.85	22.74	22.20	22.11	21.64	21.64	21.56	21.82	22.1	1 22.31	22.52	(3
Heat transfer	r coefficient,	W/K										_
65.39	65.27	65.16	64.63	64.53	64.06	64.06	63.98	64.24	64.5	3 64.73	64.94	]
Heat loss pa	arameter (H	LP), W/m²K									64	.63 (3
1.30	1.29	1.29	1.28	1.28	1.27	1.27	1.27	1.27	1.28	1.28	1.29	]
HLP (average Number of d	je)				][	_I	I		]			.28 (4
				Morr	lun	1.1.1	A	Car	0	Neu	Dec	Т
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

	<i>heating energ</i> occupancy,		pents								kWh/year 1.70
	verage hot wa		n litres per	day Vd,aver	age						74.68
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ot water	usage in litre	es per day f	or each moi	nth	][			]			
32.15	79.16	76.18	73.19	70.20	67.21	67.21	70.20	73.19	76.18	79.16	82.15
nergy co	ontent of hot	water used	N		]			]			
121.83	106.55	109.95	95.86	91.98	79.37	73.55	84.40	85.41	99.53	108.65	117.98
nergy co istributior	ontent (annua n loss	al)			/	H		N	H	R	1175.05
18.27	15.98	16.49	14.38	13.80	11.91	11.03	12.66	12.81	14.93	16.30	17.70
store lo	ss determine	d from EN 1	13203-2 test	s, taken fron	n boiler data	record				I	
	storage volu	, ,									0.00
	cylinder los	s factor (kW	/h/day)								0.0000
olume fa emperati	ure factor										0.0000 0.0000
	st from store	(kWh/day)									0.00
otal stora											
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
et storag	ge loss	л	n	A			ri			л	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rimary lo	055				1	1		I	I		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ombi los	s calculated	for each mo	onth					J	][	I	
3.05	2.75	3.05	2.95	3.05	2.95	3.05	3.05	2.95	3.05	2.95	3.05
otal heat	t required for	water heatir	ng calculated	d for each m	ionth			]			
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03
utput fro	m water hea	ter for each	month, kWh	n/month	]	JL		J			
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03
			Л					J	][	I	1210.91
eat gains	s from water	heating, kW	/h/month								
41.27	36.12	37.32	32.61	31.34	27.13	25.22	28.82	29.13	33.86	36.86	39.99
Interna	al nains										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	gains, Watts		7.61		5411	501			001		Dee
35.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23	85.23
ighting g		00.20	00.20		00.20	00.20	00.20	00.20	00.20	00.20	00.20
13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.42	8.61	10.94	12.76	13.61
ppliances		7.50	7.24	0.11	4.07	4.74	0.42	0.01	10.74	12.70	13.01
148.51	150.05	146.16	137.90	127.46	117.65	111.10	109.56	113.44	121.71	132.15	141.95
ooking		140.10	137.70	127.40	117.05	111.10	107.50	113.44	121.71	132.13	141.75
31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52
	a fans gains		51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	.g. evaporatio			3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	- ·	-		60.10	60.10	40.10	60.10	60.10	60.10	60.10	40.10
-68.18	-68.18 ating gains	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18	-68.18
		E0 1/	45.00	40.10	27.40	22.00	20.74	40.47	AE 51	E1 00	E2 7E
55.47	53.74	50.16	45.29	42.13	37.68	33.89	38.74	40.46	45.51	51.20	53.75
268.78	rnal gains	057.44	242.00	224 57	011.17	201 50	201 22	014.00	220 70	047 (0	2/0.00
	267.12	257.46	242.00	226.57	211.47	201.50	206.29	214.09	229.72	247.68	260.88

6. Solar ga	ains (calculat	tion for Janu	iary)		Area & Flu	IX		g & FF		Shading	Gains	
Window - coat (South W1	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 2.040			0.63 x 0.70		0.77	22.9391	
	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 2.040	0 36.79		0.63 x 0.70		0.77	22.9391	
	•	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 2.040	0 36.79		0.63 x 0.70		0.77	22.9391	
	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 1.450	0 36.79		0.63 x 0.70		0.77	16.3048	
	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 1.450	0 36.79		0.63 x 0.70		0.77	16.3048	
	•	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 1.750	0 36.79		0.63 x 0.70		0.77	19.6782	
	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 2.040	0 36.79		0.63 x 0.70		0.77	22.9391	
	•	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 1.890	0 11.28		0.63 x 0.70		0.77	6.5171	
	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 0.910	0 11.28		0.63 x 0.70		0.77	3.1379	
Solid door Entrance	e Door gains, Janu	arv			0.9 x 1.940	0.00		0.00 x 0.70		0.77	0.0000	(83-1)
Solar gains		ary.										(00.1)
153.70	265.01	371.12	474.12	544.08	545.88	523.90	470.83	406.65	295.19	184.68	131.16	(83)
Total gains	 S			I						I		
422.48	532.13	628.58	716.11	770.65	757.35	725.40	677.11	620.74	524.91	432.36	392.04	(84)
Window - coat (South W1		-			Area 0.9 x 2.04			g 0.80		FF x Shad 0.70 x 0.83	3 0.85	
Window - coat (South W2	-	d, argon fille	.d, low-E, Er	1=0.1, soft	0.9 x 2.04			0.80		0.70 x 0.83	3 0.85	
Window - coat (South W3	-	d, argon fille	d, low-E, Er	1=0.1, soft	0.9 x 2.04			0.80		0.70 x 0.83	3 0.85	
Window - coat (South W5	-	d, argon fille	d, low-E, Er	ı=0.1, soft	0.9 x 1.45			0.80		0.70 x 0.83	3 0.61	
Window - coat (South W7	-	d, argon fille	d, low-E, Er	ı=0.1, soft	0.9 x 1.45			0.80		0.70 x 0.83	3 0.61	
Window - coat (South W6	Double-glaze hEast)	d, argon fille	d, low-E, Er	ı=0.1, soft	0.9 x 1.75			0.80		0.70 x 0.83	3 0.73	
Window - coat (South W4	Double-glaze hWest)	d, argon fille	d, low-E, Er	ı=0.1, soft	0.9 x 2.04			0.80		0.70 x 0.83	3 0.85	
Window -												

W8

Living area fraction (26.09 / 50.49)										
Mean internal temperature (for the whole dwelling)										
19.29	19.54	19.86	20.18	20.37	20.44	20.45	20.45	20.41	20.14	
							·	<i>n</i>		

19.29	19.54	19.86	20.18	20.37	20.44	20.45	20.45	20.41	20.14	19.65	19.24	(92)
Apply adjust	ment to the	mean intern	al temperatu	ire, where a	ppropriate							
19.14	19.39	19.71	20.03	20.22	20.29	20.30	20.30	20.26	19.99	19.50	19.09	(93)

'	5 /										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation f	factor for gair	ns	1					JL			
0.99	0.97	0.92	0.82	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99
Useful gaiı	ns		1								
417.11	514.75	580.13	589.95	510.77	357.95	236.11	247.89	376.35	459.66	420.47	388.35
Monthly av	verage exterr	nal temperat	ture		_!						
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
Heat loss r	ate for mean	internal terr	perature	8		- <b>I</b>		n	R		
970.16	945.98	860.77	719.35	549.62	364.35	236.99	249.41	395.62	606.01	802.37	966.73
Fraction of	month for he	ating	1		_/			I.	N		
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
Space hea	ting requirem	ent for each	month, kW	h/month							
411.47	289.79	208.80	93.17	28.91	-	-	-	-	108.88	274.97	430.32
Total space	e heating rec	quirement pe	er year (kWł	, /year) (Octo	ber to May	)		1		JL	1846.30

Page 5 of 7

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

8c. Space cooling requirement - not applicable

	Area
Window - Double-glazed, argon filled, low-E, En=0.1, soft	0.9 x 0.91
coat (NorthEast)	

W9

GL = 6.53 / 50.49 = 0.129

C1 = 0.500

C2 = 0.960

EI = 234

Heating	system resp	onsiveness									1.00	)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
53.62	53.72	53.81	54.25	54.34	54.73	54.73	54.80	54.58	54.34	54.17	53.99	
alpha												
4.57	4.58	4.59	4.62	4.62	4.65	4.65	4.65	4.64	4.62	4.61	4.60	
Utilisation	n factor for ga	ains for living	area	λ			n					
0.99	0.98	0.94	0.86	0.71	0.53	0.39	0.43	0.66	0.91	0.98	0.99	
Mean inte	ernal tempera	ature in living	area T1		N	1		J	][	I		
19.78	20.04	20.36	20.69	20.90	20.98	21.00	20.99	20.94	20.65	20.14	19.73	
Temperat	ture during he	eating period	s in rest of	dwelling Th	2	JLJLJLJLJ	- I		1L	I		
19.84	19.85	19.85	19.86	19.86	19.87	19.87	19.87	19.86	19.86	19.85	19.85	
Utilisation	n factor for ga	ains for rest of	of dwelling		I	1	I	I	1L			
0.99	0.97	0.93	0.82	0.64	0.44	0.29	0.33	0.57	0.87	0.98	0.99	
Mean inte	ernal tempera	iture in the r	est of dwelli	ng T2	I	[		]		I		
18.76	19.01	19.33	19.63	19.80	19.86	19.86	19.87	19.84	19.60	19.12	18.71	
Living are	ea fraction (2	6.09 / 50.49	)		I	<u> </u>	_!		Į	I	0.52	
Mean inte	ernal tempera	ature (for the	whole dwe	lling)								
19.29	19.54	19.86	20.18	20.37	20.44	20.45	20.45	20.41	20.14	19.65	19.24	
Apply adj	justment to th	ne mean inte	rnal temper	ature, where	appropriate	1			1			
19.14	19.39	19.71	20.03	20.22	20.29	20.30	20.30	20.26	19.99	19.50	19.09	
<i>8. Space</i> Jan	<i>e heating requ</i> Feb	<i>uirement</i> Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	n factor for ga	ains										
0.99	0.97	0.92	0.82	0.66	0.47	0.33	0.37	0.61	0.88	0.97	0.99	
Useful ga	ains				I			I		I		
417.11	514.75	580.13	589.95	510.77	357.95	236.11	247.89	376.35	459.66	420.47	388.35	
Monthly	average exte	rnal tempera	ature				_!			_!		
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	
	s rate for mea				I	I			IL	I		
970.16	945.98	860.77	719.35	549.62	364.35	236.99	249.41	395.62	606.01	802.37	966.73	
	of month for I					[			I	I		
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
	eating require				I		_!					
•	280 70			28.91					108.88	274 97	430.32	

36.57

(99)

FF x Shading

0.70 x 0.83

g 0.80

9a. Energy	requireme	nts									White	
Fraction of	space heat	system sele							1.0000		kWh/year	(202)
	~	ting system	1	1	7/		-1	- V	0.50%			(206)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	ting requirer	1	1		1	-1		1	-16	10		
411.47	289.79	208.80	93.17	28.91	-	-	-	-	108.88	274.97	430.32	(98)
Appendix (	2 - monthly	energy save	ed (main he	ating system	1)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heat	ting fuel (ma	ain heating s	ystem 1)									
454.66	320.21	230.72	102.95	31.94	-	-	-	-	120.31	303.83	475.49	(211)
Appendix (	2 - monthly	energy save	ed (main he	ating system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heat	ting fuel (ma	ain heating s	ystem 2)	2			A	- JL	<u>,                                    </u>	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix (	2 - monthly	energy sav	ed (seconda	ry heating	system)	JI						
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space hea	ting fuel (se	econdary)			]	]I						
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heat	ing		JL		1		_!					
Water heat	ing requirem	nent										
124.87	109.30	113.00	98.81	95.02	82.32	76.59	87.44	88.35	102.58	111.59	121.03	(64)
Efficiency of	of water hea	iter	<u>n</u>		Л	R	A	Л	U	ļ.	87.30	(216)
89.73	89.60	89.35	88.82	88.03	87.30	87.30	87.30	87.30	88.92	89.55	89.78	(217)
Water heat	ing fuel	_яя			1		A					
139.16	121.99	126.47	111.24	107.95	94.29	87.74	100.16	101.21	115.36	124.61	134.81	(219)
Annual tota	l				,			101.21	110.00	121.01	kWh/year	
•	ting fuel (se	ed, main syst	em i								2040.11 0.00	(211) (215)
Water heat	-	,oondary)									1364.99	
Electricity f	for pumps, f	ans and elec	tric keep-ho	t								
	eating pump										30.00	( )
	h a fan-assis		haar								45.00	. ,
	-	above, kWh 100.00% fixe	-								75.00 233.81	
5		ion technolo	-								233.01	(232)
0,	00	950.616 x 0	•								412.491	
PVs 0.8	0 x 0.000 x	0.000 x 0.50	00								0.000	
PVs 0.8	0 x 0.000 x	0.000 x 0.50	00								0.000	
Annondiv (	۰ ۲										412.491	(233)
Appendix C Energy s	2 - saved or ge	nerated ∆.									0.000	(236a)
Energy I	-										0.000	. ,
		for all uses									3301.42	

10a. Does not apply

11a. Does not apply

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	2040.11	0.216	440.66	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1364.99	0.216	294.84	(264)
Space and water heating			735.50	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	233.81	0.519	121.35	(268)
Electricity generated - PVs	-412.49	0.519	-214.08	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			681.69	(272)
			light and light	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 13.50 (273)



#### Project Information Building type Top-floor flat

Reference Date	9913 15 April 2020		
Client	GBS Architectural Design Lombard Business Park 8 Lombard Road Wimbledon SW19 3TZ	Project	Flat 5 - Green 130 Chalton Street London NW1 1RX

### EPS Group

3C Pelham Court Pelham Road Nottingham 0115 7270599 info@epsgroup.co.uk

#### SAP 2012 worksheet for New dwelling as built - calculation of dwelling emissions

1. Overall dwelling dimensions

	d albar flaara						Area (m²)		Av. Storey height (m)		Volume (m <sup>3</sup> )	10	(2.5)
Total floor	d other floors <sup>.</sup> area volume (m <sup>3</sup> )	i					68.84 68.84		2.40		165.2 165.2		(3a) (4) (5)
2. Ventila	ntion rate										m³ r	er hou	r
							main + seor	ndary + oth	er				
							heating						
Number of	of chimneys						0 + 0 + 0		x 40			0.00	) (6a)
Number o	f open flues						0 + 0 + 0		x 20			0.00	( )
	f intermittent						2		x 10			20.00	· · ·
	of passive ve						0		x 10			0.00	. ,
Number o	f flueless gas	s fires					0		x 40			0.00	) (7c)
											Air	hange	s per hour
Infiltration	due to chimi	nevs, fans an	nd flues								7.11 \	0.12	-
	test, result q	-							4.50				(17)
Air perme	-											0.35	
Number o	of sides on w	hich sheltere	d									1.00	) (19)
Shelter fac	ctor											0.93	3 (20)
Infiltration	rate incorpor	ating shelter t	factor									0.32	2 (21)
Infiltration	rate modified	d for monthly	wind speed										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
Wind Fact	tor							I				52.50	) (22)
1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18		
L	JI	JL	11		1(	I		][		][		13.13	3 (22a)
Adjusted i	infiltration rate	e (allowing fo		-	ed)								
0.41	0.40	0.39	0.35	0.34	0.30	0.30	0.30	0.32	0.34	0.36	0.38		
	n : natural ve air change ra		mittent extra	ict fans								4.20	) (22b)
0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
L							A						

<i>3. Heat los</i> Element	sses and he	<i>at loss paran</i> Gross		enings	Net area		U-value	ΑxU		kappa-value	АхК	
		area, m <sup>2</sup>	m²		A, m²		W/m²K	W/K		kJ/m²K	kJ/K	
	-	ed, argon fille			1.2	50	1.33 (1.40)		1.66			(27)
	=0.1, soft co	at (SouthWes	st)									
W1	<b>D</b> 11 1				4.01	50	4 00 (4 40)					(07)
	-	ed, argon fille at (SouthWes			1.2	50	1.33 (1.40)		1.66			(27)
	Double-glaze	ed, argon fille	ed,		1.2	50	1.33 (1.40)		1.66			(27)
	0	at (SouthWes										
low-E, En=		ed, argon fille at (NorthEast			1.89	90	1.33 (1.40)		2.51			(27)
W7	Daubla alam	ad armon fills	a		0.0	10	1 22 (1 40)		1 1 1			(17)
	-	ed, argon fille at (NorthEasi			0.84	40	1.33 (1.40)		1.11			(27)
	Double-glaze	ed, argon fille	ed,		3.1	50	1.33 (1.40)		4.18			(27)
	-	at (NorthEast					. ,					. ,
W4												
Solid door					1.9	40	0.66		1.28			(26)
Entrance	e Door											
Walls External	Wall				83.	25	0.22		18.31	190.00	15817.50	(29)
Walls Seperati	ing Wall to L	Inheated Cor	ridor		13.	77	0.22		3.03	0.00	0.00	(29)
Flat roofs					64.	34	0.15		9.65	9.00	579.06	(30)
Pitched roo	ofs insulated	between raf	ters		6.	21	0.15		0.93	9.00	55.89	(30)
Tatal and	-f	demonstra Cira									170	14 (01)
	at loss, W/K	elements Sig	ma A, m²								179. 45.	( )
		eter, kJ/m²K	lusar spaci	fied TMD)							45. 100.	( )
	nermal bridge		(user-speci	neu nvn )							8.	. ,
Total fabric	0	53									54.	
		alculated mor	hthlv								54.	50 (57)
31.80	31.63	31.45	30.64	30.49	29.78	29.7	8 29.65	30.05	30.49	30.80	31.12	(38)
	fer coefficier		30.04	30.47	27.70	27.70	27.00	30.03	30.49	50.00	51.12	(50)
			1	1								
86.36	86.19	86.02	85.20	85.05	84.34	84.34	4 84.21	84.62	85.05	85.36	85.68	
Heat loss	parameter (I	HLP), W/m²K									85.	20 (39)
1.25	1.25	1.25	1.24	1.24	1.23	1.23	1.22	1.23	1.24	1.24	1.24	
HLP (aver	age)	_,	л		]	][		JL	<u> </u>	Л	1.	24 (40)
Number of	f days in mo	onth (Table 1a	a)									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	
			LĨ									

4. Water h	heating energ	ny requirem	ents								kWh/year
	occupancy,										2.2
Annual ave	erage hot wa	iter usage ii	n litres per d	ay Vd,avera	age						86.8
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
lot water	usage in litre	s per day fo	or each mont	h							
95.56	92.08	88.61	85.13	81.66	78.18	78.18	81.66	85.13	88.61	92.08	95.56
Energy cor	ntent of hot v	water used	1								
141.71	123.94	127.89	111.50	106.99	92.32	85.55	98.17	99.34	115.77	126.38	137.24
Energy co	ntent (annual	 l)	1		1						1366.79
Distribution	n loss										
21.26	18.59	19.18	16.72	16.05	13.85	12.83	14.73	14.90	17.37	18.96	20.59
store los	 ss determined	d from EN 1	3203-2 tests	taken from	boiler data	record					
Hot water	storage volu	me (litres)									0.0
	cylinder loss	factor (kW	h/day)								0.000
/olume fac											0.000
emperatu	re factor st from store	(W/Wb/day)									0.000
Total stora		(KWII/Udy)									0.0
0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vet storage		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	- Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary lo	- Y	1			-16						
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi loss	s calculated 1	for each mo	onth								
3.05	2.75	3.05	2.95	3.05	2.95	3.05	3.05	2.95	3.05	2.95	3.05
fotal heat	required for	water heatin	g calculated	for each me	onth					R	
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28
Dutput fror	m water heat	er for each	month, kWh/	month				I			
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28
											1402.6
leat gains	from water	heating, kW	'h/month								
47.88	41.90	43.29	37.81	36.33	31.43	29.21	33.40	33.77	39.26	42.76	46.39
				l							
5. Internal	l gains										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aetabolic g	gains, Watts		1								
110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88	110.88
ighting ga	ains	]						I	I	I	
18.61	16.53	13.44	10.18	7.61	6.42	6.94	9.02	12.11	15.38	17.95	19.13
Appliances	aains	]									
194.57	196.59	191.51	180.67	167.00	154.15	145.56	143.55	148.63	159.47	173.14	185.99
Cooking g		171.51	100.07	107.00	134.13	143.30	143.00	140.00	137.47	175.14	100.77
		24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09	34.09
	d fans gains										
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
osses e.q	g. evaporatio	n (negative	values)								
-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71	-88.71
Vater heat	ting gains						<i>n</i>			л	
64.35	62.35	58.18	52.51	48.84	43.66	39.26	44.90	46.90	52.76	59.38	62.36
Total interr	nal gains					]I	_11		II		
336.81	334.74	322.39	302.63	282.71	263.50	251.03	256.73	266.91	286.87	309.73	326.74
		" OFF.J/	002.00	202.11	200.00	201.00	200.75	200.71	200.07	007.75	020.17

6. Solar gains	Icalculation	for Inniarial
0 SULAI UAILIS	((.all.1)/all()//	In Janual VI

6. Solar gains (calculation for January)				
	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W1	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W2	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest)	0.9 x 1.250 36.79	0.63 x 0.70	0.77	14.0558
W3 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 1.890 11.28	0.63 x 0.70	0.77	6.5171
W7 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 0.840 11.28	0.63 x 0.70	0.77	2.8965
W5 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 3.150 11.28	0.63 x 0.70	0.77	10.8619
W4 Solid door	0.9 x 1.940 0.00	0.00 x 0.70	0.77	0.0000
Entrance Door Total solar gains, January				62.44 (83-1)
Solar gains				
62.44 113.10 172.63 243.89 300.54	310.41 294.25 250.1	5 197.02 129.8	76.02	52.64 (83)
Total gains	, , , , , , , , , , , , , , , , , , ,		,,	
399.25         447.83         495.03         546.52         583.25	573.90 545.28 506.8	8 463.93 416.6	9 385.75	379.38 (84)
<i>Lighting calculations</i> Window - Double-glazed, argon filled, low-E, En=0.1, soft	Area 0.9 x 1.25	g 0.80	FF x Shading 0.70 x 0.83	0.52
coat (SouthWest) W1				
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W2	0.9 x 1.25	0.80	0.70 x 0.83	0.52
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) W3	0.9 x 1.25	0.80	0.70 x 0.83	0.52
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 1.89	0.80	0.70 x 0.83	0.79
W7 Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)	0.9 x 0.84	0.80	0.70 x 0.83	0.35
W5				
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) W4	0.9 x 3.15	0.80	0.70 x 0.83	1.32

C2 = 1.030

EI = 329

	Feb	Mar	Apr	May	lun	Jul	A.u.a	Sep	Oct	Nov	Dee
Jan au	Feb	war	Apr	Мау	Jun	Jui	Aug	Sep	Oci	NOV	Dec
22.14	22.19	22.23	22.44	22.48	22.67	22.67	22.71	22.60	22.48	22.40	22.32
alpha	22.17	22.25	22.44	22.40	22.07	22.07	22.71	22.00	22.40	22.40	22.52
2.48	2.48	2.48	2.50	2.50	2.51	2.51	2.51	2.51	2.50	2.49	2.49
	factor for ga			]			1				
0.97	0.96	0.94	0.89	0.81	0.69	0.57	0.61	0.79	0.91	0.96	0.97
Mean inte	rnal tempera	ture in living	area T1								
18.36	18.60	19.03	19.63	20.20	20.64	20.85	20.81	20.45	19.73	18.94	18.31
Temperati	ure during he	eating period	s in rest of d	welling Th2	IL } -	I		][	<u> </u>	JÍ	
19.88	19.88	19.88	19.89	19.89	19.90	19.90	19.90	19.90	19.89	19.89	19.88
Utilisation	factor for ga	ins for rest c	f dwelling	л	н	Л	н	J.	)I	н	я
0.96	0.95	0.93	0.87	0.77	0.62	0.46	0.51	0.73	0.89	0.95	0.97
Mean inte	rnal tempera	ture in the re	est of dwelling	g T2	JL			л	JL	R	
17.47	17.71	18.14	18.73	19.27	19.67	19.83	19.81	19.52	18.84	18.06	17.43
•	a fraction (2										0.3
17.82	18.06	18.49	whole dwelli 19.08	19.64	20.05	20.23	20.20	19.88	19.18	18.41	17.77
			rnal temperat			20.23	20.20	19.00	19.10	10.41	17.77
	17.91	18.34	18.93	19.49	19.90	20.08	20.05	19.73	19.03	18.26	17.62
17 67	11.71	10.54	10.75	17.47	17.70	20.00	20.05	17.75	17.05	10.20	17.02
17.67				0							
17.67				-							
	heating requ	lirement									
	heating requ	<i>uirement</i> Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>8. Space .</i> Jan		Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>8. Space .</i> Jan	Feb	Mar	Apr 0.85	May 0.76	Jun 0.62	Jul 0.48	Aug 0.52	Sep 0.72	Oct 0.87	Nov 0.93	Dec 0.96
<i>8. Space .</i> Jan Utilisation 0.95	Feb factor for ga	Mar									
<i>8. Space .</i> Jan Utilisation 0.95	Feb factor for ga	Mar									
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92	Feb factor for ga 0.94 ins	Mar ins 0.91 448.83	0.85	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92	Feb factor for ga 0.94 ins 418.99	Mar ins 0.91 448.83	0.85	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8 Space</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30	Feb factor for ga 0.94 ins 418.99 average exte	Mar ins 0.91 448.83 mal tempera 6.50	0.85 464.89 ture 8.90	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space I.</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30	Feb factor for ga 0.94 ins 418.99 average exte 4.90	Mar ins 0.91 448.83 mal tempera 6.50	0.85 464.89 ture 8.90	0.76	0.62	0.48	0.52	0.72	0.87	0.93	0.96
<i>8. Space .</i> Jan Utilisation 0.95 Useful ga 379.92 Monthly a 4.30 Heat loss 1154.41	Feb factor for ga 0.94 ins 418.99 average exte 4.90 rate for mea	Mar ins 0.91 448.83 rnal tempera 6.50 n internal ter 1018.42	0.85 464.89 ture 8.90 mperature	0.76	0.62 356.63 14.60	0.48 260.97 16.60	0.52	0.72 336.05 14.10	0.87 363.86 10.60	0.93 360.57 7.10	0.96 362.94 4.20

Total space heating requirement per year (kWh/year) (October to May)

280.70

163.74

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

471.71

576.22

423.78

8c. Space cooling requirement - not applicable

263.04

426.04

585.67

3190.90

46.35

(98)

(99)

9a. Energy	v requireme	nts									kWbboor	
Fraction of	space heat	system sele							1.0000		kWh/year	(202)
-	of main hea		0	1.4	1				90.50%	New		(206)
Jan Space boo	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	ting requirer	1	200 70	1/0 74	1	-16	1		0/2.04	424.04	F0F (7	(00)
576.22	471.71	423.78	280.70	163.74	- 1)	-	-	-	263.04	426.04	585.67	(98)
	-,	energy save	-	7 <b></b>	י ו) ר	-1	1					(010)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
		ain heating s		1 4 9 9 9 9	1	-16	-1					(011)
636.70	521.23	468.26	310.16	180.93	-	-	-	-	290.65	470.76	647.15	(211)
	-	energy save	Jr.		1 2)		-1					(21.2)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
r	10	ain heating s	10		1	-16						
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
	-	energy sav	-)r		system)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space hea	ting fuel (se	econdary)										
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heat	-											
	ing requirem	- V	1	v	1		- Y					
144.75	126.69	130.94	114.45	110.03	95.27	88.60	101.21	102.29	118.82	129.32	140.28	(64)
	of water hea	iter		M		- Jr					.3	· · /
89.84	89.80	89.72	89.55	89.19	87.30	87.30	87.30	87.30	89.48	89.73	89.86	(217)
Water heat	ing fuel											
161.12	141.07	145.94	127.80	123.37	109.13	101.48	115.94	117.17	132.79	144.12	156.10	(219)
	ting fuel use	ed, main syst	tem 1	A	Л			Л			kWh/year 3525.8	· · ·
Space hea Water heat	ting fuel (se	econdary)									0.0 1576.0	( )
	0	ans and elec	tric keep-ho	t							1570.0	(217)
-	eating pump										30.0	00 (230c)
	h a fan-assis										45.0	. ,
	-	above, kWh	-								75.0	. ,
		100.00% fixe ion technolo	-								328.7	/1 (232)
		950.616 x 0	-								562.76	5
		0.000 x 0.50									0.00	
PVs 0.8	0 x 0.000 x	0.000 x 0.50	00								0.00	
	2										562.76	5 (233)
Appendix (	) - saved or ge	nerated A.									0.00	)0 (236a)
Energy	-	norated V.									0.00	
		for all uses									4942.8	

10a. Does not apply

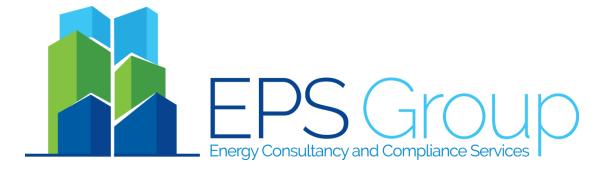
11a. Does not apply

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating, main system 1	3525.85	0.216	761.58	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1576.04	0.216	340.43	(264)
Space and water heating			1102.01	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	328.71	0.519	170.60	(268)
Electricity generated - PVs	-562.76	0.519	-292.07	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1019.46	(272)
			ka/m²/vear	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 14.81 (273)



## Appendix 4:

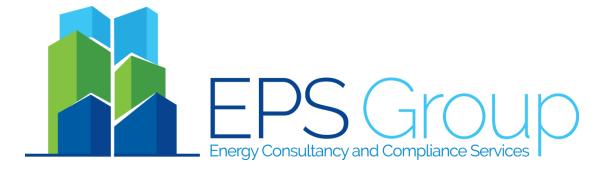
## SAP Derived Summertime Overheating Analysis

#### SAP 2012 Overheating Assessment for New dwelling as built

Dwelling type Number of storeys Cross ventilation possible Region Front of dwelling faces	1 Ye Th Se	id-floor flat es names Valley outhWest					
Overshading Overhangs		verage or unknown (20-60 % sk is detailed below)	(y blocked)				
Thermal mass parameter		50.00 (user defined)					
Night ventilation	N						
Ventilation rate during hot weather	(ach) 6.	00 (Windows fully open)					
Summer ventilation heat loss coeff	icient			239.93	(P1)		
Transmission heat loss coefficient				42.42	(37)		
Summer heat loss coefficient				282.35	(P2)		
Overhangs			7 1				
Orientation		Ratio	Z_overhangs	Overhang type			
NorthEast NorthEast		-	1.00	None			
SouthWest		-	1.00 1.00	None None			
SouthEast		-	1.00	None			
SouthEast		-	1.00	None			
SouthEast			1.00	None			
SouthWest		-	1.00	None			
SouthWest		-	1.00	None			
SouthWest		-	1.00	None			
Solar shading							
Orientation	Z blinds	Solar access	Overhangs	Z summer			
NorthEast	1.00	0.90	1.000	0.900	(P8)		
NorthEast	1.00	0.90	1.000	0.900	(P8)		
SouthWest	1.00	0.90	1.000	0.900	(P8)		
SouthEast	1.00	0.90	1.000	0.900	(P8)		
SouthEast	1.00	0.90	1.000	0.900	(P8)		
SouthEast	1.00	0.90	1.000	0.900	(P8)		
SouthWest	1.00	0.90	1.000	0.900	(P8)		
SouthWest	1.00	0.90	1.000	0.900	(P8)		
SouthWest	1.00	0.90	1.000	0.900	(P8)		
Solar gains (calculation for July)							
Orientation	Area	Flux	g & FF	Shading	Gains		
NorthEast	0.9 x 0.9		0.63 x 0.70	0.90		30	
NorthEast	0.9 x 1.8		0.63 x 0.70	0.90		62	
SouthWest	0.9 x 2.0		0.63 x 0.70	0.90		83	
SouthEast	0.9 x 1.7		0.63 x 0.70	0.90		71	
SouthEast	0.9 x 1.4		0.63 x 0.70	0.90		59	
SouthEast	0.9 x 1.4		0.63 x 0.70	0.90		59	
SouthWest	0.9 x 2.0		0.63 x 0.70	0.90		83	
SouthWest	0.9 x 2.0		0.63 x 0.70	0.90		83	
SouthWest	0.9 x 2.0	)4 113.91	0.63 x 0.70	0.90		83	
Total						612	

#### SAP 2012 Overheating Assessment for New dwelling as built

Dwelling type Number of storeys Cross ventilation possible Region Front of dwelling faces Overshading Overhangs Thermal mass parameter Night ventilation Ventilation rate during hot weather (	1 Ye: Tha Sou Ave (as 100 No	p-floor flat s imes Valley ithWest irage or unknown (20-60 % sky detailed below) i.00 (user defined) 0 (Windows fully open)	/ blocked)						
Summer ventilation heat loss coeffi Transmission heat loss coefficient Summer heat loss coefficient	cient				327.13 54.56 381.69	(P1) (37) (P2)			
Overhangs Orientation NorthEast NorthEast SouthWest SouthWest SouthWest		Ratio - - - - -	Z_overhangs 1.00 1.00 1.00 1.00 1.00 1.00	Ove Noi Noi Noi Noi Noi Noi	ne ne ne				
Solar shading Orientation NorthEast NorthEast	Z blinds 1.00 1.00	Solar access 0.90 0.90	Overhangs 1.000 1.000		summer 0.900 0.900	(P8) (P8)			
NorthEast SouthWest SouthWest SouthWest	1.00 1.00 1.00 1.00	0.90 0.90 0.90 0.90	1.000 1.000 1.000 1.000		0.900 0.900 0.900 0.900 0.900	(P8) (P8) (P8) (P8) (P8)			
Solar gains (calculation for July) Orientation NorthEast NorthEast NorthEast	Area 0.9 x 3.15 0.9 x 0.84 0.9 x 1.89	91.10	g & FF 0.63 x 0.70 0.63 x 0.70 0.63 x 0.70	Sha	ading 0.90 0.90 0.90	(	Gains	103 27 62	
SouthWest SouthWest SouthWest Total	0.9 x 1.25 0.9 x 1.25 0.9 x 1.25	113.91 113.91	0.63 x 0.70 0.63 x 0.70 0.63 x 0.70		0.90 0.90 0.90			51 51 51 344	
Solar gains Internal gains Total summer gains Summer gain/loss ratio External temperature (Thames Vall Thermal mass temperature increment Threshold temperature	ent (TMP=10	0.0)		Jun 363 385 747 1.96 15.4 1.30 18.66	Jul 344 369 713 1.87 17.8 1.30 20.97	Aug	292 377 669 1.75 17.8 1.30 20.85	(P3) (P5) (P6) (P7)	
Likelihood of high internal temperatu Assessment of likelihood of high int		rature		Not sig.	Slight Slight	Slight			



## Appendix 5:

Model Water Consumption Calculation

#### Water Efficiency Calculator for New Dwellings (V1e)

Flat 1, 130 Chalton Street

1

# Project Details Adress/Reference Number of Bedrooms



9913

Case Reference Occupancy for Calculation Purposes

Appliance/Useage Details

#### Taps (Excluding Kitchen Taps)

Tap Fitting Type	Flow Rate	Quantity	Total per
	Litres/Min	(No.)	Fitting type
Bathroom Mixer	4.00		1 4.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No	.)		1
Total Flow (I/s)			4.00
Maximum Flow (I/s)			4.00
Average Flow (I/s)			4.00
Weighted Average Flow	/ (I/s)		2.80
Flow for Calculation (I/s	;)		4.00

#### Baths

Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bath	170.00	1	170.00
			0.00
			0.00
			0.00
Total No. of Fittings (No	).)	1	-
Total Capacity (I)			170.00
Maximum Capacity (I)			170.00
Average Capacity (I)			170.00
Weighted Average Capa	acity (I)		119.00
<b>Capacity for Calculation</b>	n (l)		170.00

#### Dishwashers

	L per Place Setting	Quantity (No.)	Total per Fitting type
None			0.00
			0.00
Total No. of Fittings (No	.)	0	
Total Consumption (I)			1.25
Maximum Consumption (I)			1.25
Average Consumption (I/s)			1.25
Weighted Average Consumption (I)			0.88
Consumption for Calculation (I/s)			1.25

#### **Kitchen Taps**

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type	
Kitchen Mixer	6.00	1	6.00	
			0.00	
			0.00	
Total No. of Fittings (No.) 1				
Total Flow (I/s)	6.00			
Maximum Flow (I/s)	6.00			
Average Flow (I/s)	6.00			
Weighted Average Flow	4.20			
Flow for Calculation (I/s	5)		6.00	

#### Showers Shower fitting Flow Rate Quantity Total per

•				
Туре	Litres/Min	(No.)	Fitting type	
Bath Shower Mixer	8.50	1	8.50	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
Total No. of Fittings (No	.)	1	•	
Total Flow (I/s)			8.50	
Maximum Flow (I/s)	8.50			
Average Flow (I/s)	8.50			
Weighted Average Flow	5.95			
Flow for Calculation (I/s)				

#### WCs

WC Туре	Full Flush Volume	Part Flush Volume	Quantity (No)	
Dual Flush Cistern	5.00	3.00		1

Total number of fittings Average effective flushing volume

0.00

#### **Washing Machines**

Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (I	C	)	
Total Consumption (I)			8.17
Maximum Consumption (I)			8.17
Average Consumption (I/s)			8.17
Weighted Average Consumption (I)			5.72
Consumption for Calculation (I/s)			8.17

**Other Fittings** 

Waste Disposal Y/N	N
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (I)	
Total Availble Grey Water Supply (I)	111.69
Possible Demand (I)	66.67
Grey/Rain Installed Capacity (I)	
Figure for Calculation lit/person/day	0.00

#### Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	Total Use (I/p/day)	
WC Single Flush	Volume (I)	0.00	4.42			1
WC Dual Flush	Full Flush (I)	5.00	1.46	0.00	7.30	
	Pt Flush (I)	3.00	2.96	0.00	8.88	
WC's (Multiple)	Volume (I)	0.00	4.42	0.00	0.00	
Taps Exc. Kitchen	Flow Rate	4.00	1.58	1.58	7.90	
Bath (shower present)	(l/s)	170.00	0.11	0.00	18.70	
Shower (bath present)	(l/s)	8.50	4.37	0.00	37.15	
Bath Only	(I)	0.00	0.50	0.00	0.00	
Shower Only	(l/s)	0.00	5.60	0.00	0.00	
Kitchen Taps	(l/s)	6.00	0.44	10.36	13.00	
Washing Machines	(l/kgdry)	8.17	2.10	0.00	17.16	<< Note - these may be default values.
Dishwashers	(l/place)	1.25	3.60	0.00	4.50	<< You can change them by entering
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00	the actual applicances in the
Water Softner	(l/s)	0.00	1.00	0.00	0.00	appropriate sections above
<b>Total Calculated Water</b>	Use (l/p/day)				114.58	
Grey/RainWater Reused	I (I)				0.00	
Normalisation Factor	(Factor)				0.91	
Total Consumption CSH (I/p/day)				104.27		
External Water Use Allowance (I)			5.00			
Total Comsumption Pa	rt G (l/p/day)				109.27	
Assesment Result					PASS	