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KINGS MEWS, LONDON BOROUGH OF CAMDEN

Energy Strategy

G&T Kings Mews.

April 2015

Quality Management

Issue/revision	Issue 1	Revision 1
Remarks	Draft	Updated plans
Date	09/04/2015	24/04/15
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Authorised by	Barny Evans	Barny Evans
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Project number	70007778	70007778
Report number	1	1
File reference		

Kings Mews, London Borough of Camden

Energy Strategy

24/04/2014

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Executive Summary

WSP was appointed to develop this Energy Strategy which serves to support the detailed planning application for the residential development at Kings Mews, in the London Borough of Camden (hereafter referred to as "the site"). The development involves the development of two new build dwellings.

The aim of this Energy Strategy is to show how the development is proposed to adhere with local and national policies regarding carbon emissions, energy consumption, and the use of renewable energy.

The relevant policies considered in this Energy Strategy are:

- Part L of the Building Regulations 2013;
- London Plan 2015;
- Sustainable Design and Construction Supplementary Planning Guidance (SPG) April 2014

The requirement of Part L 2013 has two main elements, relevant to the new buildings within this development:

1. Fabric Energy Efficiency (FEE) – Each home must demonstrate that its specification, fabric standards, air permeability and glazing does not exceed a threshold given in kWh per m^2 per year.
2. Target Emission Rate (TER) – As well as the fabric standard a specific TER is set for the new home in terms of emissions, given as kg CO_2 per m^2 per year.

The requirement of the London Plan has two main elements including;

1. Residential dwellings to achieve a 35% carbon reduction beyond Part L 2013 of the Building Regulations.
2. The development will be required to maximise renewable energy generation to achieve at least a 20% reduction in carbon dioxide.

A review of all the relevant policy is included in the policy section on pages 9 and 10.

In order to model the anticipated emissions two representative models of housing units were developed based on the drawing received and the schedule of accommodation (Appendix A). The results of both SAP models were combined to give an estimate of total site emissions and to provide a benchmark for the Energy Hierarchy assessment. The results of the application of efficiency measures are shown, (be lean), the application of combined heat and power (be clean) (not used in this case), and finally the CO_2 emissions reduction from renewable energy sources are applied, (be green) to achieve the target, see graph below.

A study was carried out in order to outline which technologies were considered applicable to the development.

The following technologies were considered in the renewable energy study:

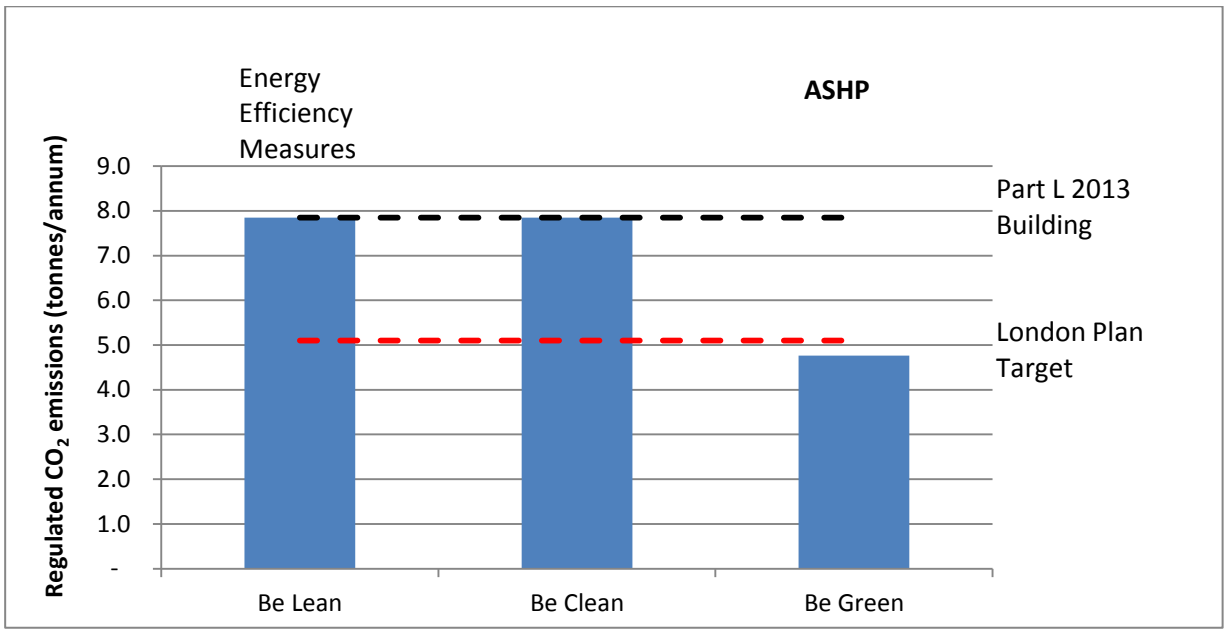
- ✓ Photovoltaic;
- ✓ Solar Thermal;
- ✓ Wind Turbines;
- ✓ Biomass boilers;
- ✓ Ground/Air Source Heat Pumps; and
- ✓ Gas Combined Heat and Power (CHP).

Wind turbines have been ruled out at the site given the low wind resource and proximity to dwellings as the development lies within an urban area.

Gas-fired Combined Heat and Power is not suitable given the number of dwellings at the site being below threshold. Biomass boilers are also not suitable given low number of dwellings at the site and due to its location within an Air Quality management area.

Roof mounted photovoltaic and solar thermal panels have been ruled out given the sites location within the Bloomsbury Conservation Area.

The recommended approach is to deploy an air source heat pump system at each of the dwellings. This approach would allow the dwellings to be heated and cooled using an efficient unit, with zero emissions at point of use and would negate the requirement to include gas boilers within each dwelling. A ground source heat pump is also applicable however would require the inclusion of boreholes.



	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	7.8	2.2
After energy demand reduction	7.8	2.2
After CHP	7.8	2.2
After renewable energy	4.8	2.2

1 Introduction

1.1 General

1.1.1 WSP was commissioned by G&T John Street Ltd. to develop an Energy Strategy that would consider relevant local and national policies governing sustainable construction, and provide recommendations for the development in regard to satisfying these policies.

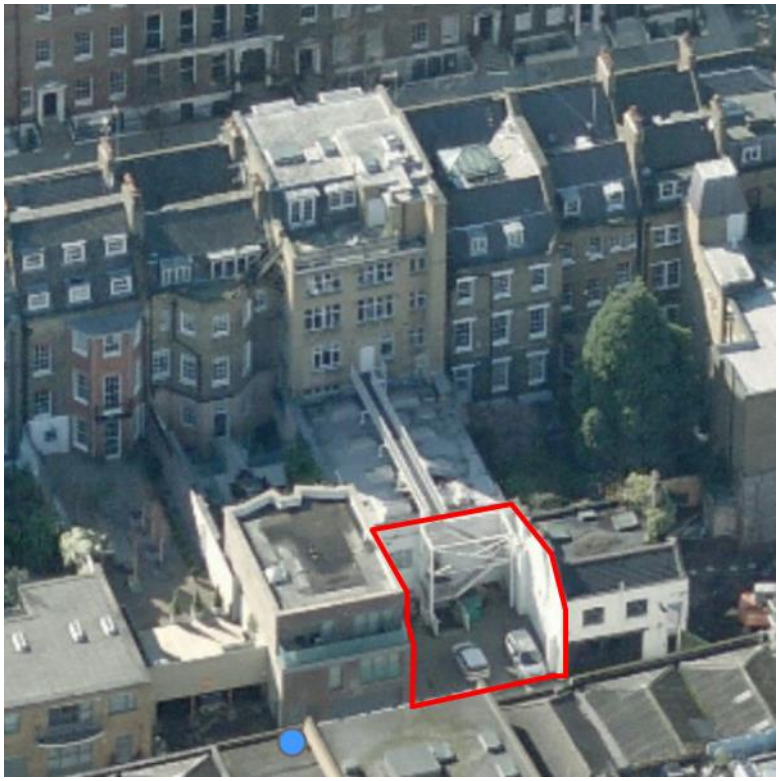
1.1.2 The proposed development comprises the development of two new build dwellings.

1.1.3 Collectively the scheme proposed for the site will be referred to as the Proposed Development.

1.2 Site Review

1.2.1 The site is located on Kings Mews in the London Borough of Camden. It is at present hard landscaping used as a car park.

Picture 1 Site Location



2 Current Policy Context

The national and local policies relevant to the Proposed Development are detailed below:

Policy		
UK Government	**Local Policy**	**Project Target**
Climate Change Act 2008 The Government's renewable energy strategy aims to cut its carbon dioxide emissions by 29% against 1990 baseline levels by 2017. **Building Regulations Part L 2013.** New dwellings must achieve or better the Target Fabric Energy Efficiency (TFEE) and the Target Emissions Rate (TER). The Target Fabric Energy Efficiency is based on a notional building the same size and shape as the actual using the values detailed in SAP 2012 (Appendix B), The dwelling fabric energy efficiency must be within 15% of this. This effectively requires a minimum level of building fabric energy efficiency for compliance and is detailed as kWh/m^2/year. The Target Emissions Rate is a representation of allowable emissions per m^2 based on regulated loads of building.	**London Plan 2015 and updates** Policies relevant to energy consumption and CO_2 emissions include: Policy 5.2 Minimising Carbon Dioxide Emissions Policy 5.3 Sustainable Design and Construction Policy 5.4 Retrofitting Policy 5.5 Decentralised Energy Networks Policy 5.6 Decentralised Energy in Development Proposals Policy 5.7 Renewable Energy Policy 5.9 Overheating and Cooling The requirements detailed in the London Plan include: 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 Furthermore, developments must: - Achieve a 35% improvement on emissions against Part L of Building Regulations 2013. - Assess the feasibility of connecting to existing heat networks and if not feasible investigate the practicality of connection to a CHP and DHN. - Assess the feasibility of including on-site renewables. - Mitigate the potential risk of overheating (need for cooling should be mitigated)	35% reduction in carbon emissions against Part L of the Building Regulations 2013. Minimise energy consumption through energy efficiency Investigate feasibility of connecting to an existing heat network Investigate inclusion of DHN and connecting all dwellings to heat network Assumption of a contribution to emissions reductions from on-site renewables with a target of a 20% contribution

Table 1 Policy Context

3 Site Energy Demand

3.1 Baseline and 'Be Lean' Emissions

3.1.1 The models developed for both units were based on drawings and the Schedule of Accommodation (Appendix A) received. The results of both models were combined to provide an estimate of the regulated energy demand for the proposed development.

3.1.2 The baseline models for the dwellings were developed with the National Home Energy Assessor (NHER) software, at this stage of development, the fabric values used are indicative only and have been based on the values of a notional building as detailed in Appendix R of SAP 2012. It is possible due to the Conservation Area status of the site that alteration of this will be required

3.1.3 The specifications detailed in SAP 2012 are used as a guide to achieve both Target Emissions Rate (TER) and Target Fabric Energy Efficiency (TFEE), and thus compliance with Part L of Building Regulations 2013. Therefore, levels used in this modelling represent the 'Be Lean' approach required.

3.1.4 The Target Emission Rate for both units was found to be 18.9 kg $CO_2/m^2/yr$. When extrapolated for total area this gives a total emissions figure of 7.85tCO_2/year from the new build residential units.

3.1.5 The remaining CO_2 emissions savings required from 'Be Clean' or 'Be Green' methods is therefore 2.75 tCO_2/year, (35%).

4 Be Clean

Following the application of efficiency measures, the next step is to consider which technologies can provide further improvement in CO_2 emissions. Following the London Plan, the recommended hierarchy is:

- Prioritise connection to existing heat networks;
- Allow for connection to planned networks; and
- Include a site wide heat network.

4.1 Existing and Planned Heat Networks

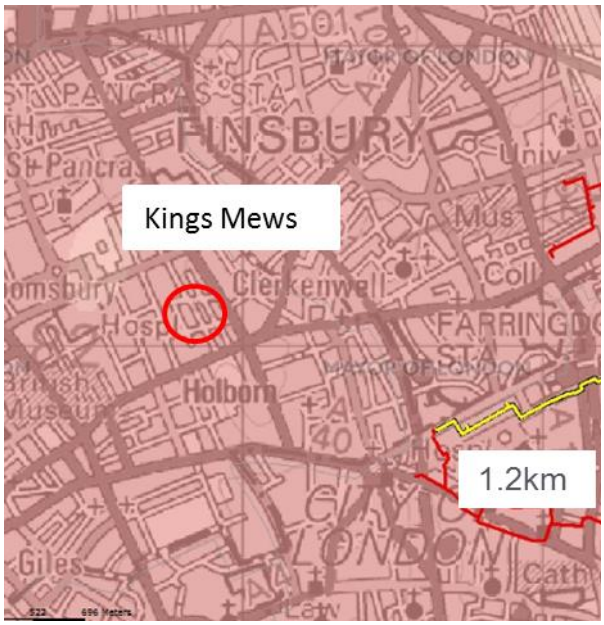


Figure 1: Existing Heat Networks and Site Location (London Heat Map)

4.1.1 As shown by Figure 2, the Smithfield district network is over 1.2km from the site.

4.1.2 The number of units at the site does not warrant the development of an underground insulated pipe network as it would not be cost effective.

4.1.3 Connection to a heat network would involve the installation of underground insulated flow and return pipes - at these distances and low number of units to be developed connection to any of the existing schemes is not economically viable.

4.1.4 There are also no planned heat networks within close proximity of the site.

4.2 Site Wide Heat Network

4.2.1 A minimum of 300 dwellings (or equivalent) with a density of greater than 60 dwellings per hectare is generally the threshold before which a CHP district heat network is considered. This is due to the relatively small energy demand from residential developments and additional administrative burden of developing such schemes at a scale where energy service companies (ESCOs) are generally not active.

4.2.2 The proposed development does meet the minimum threshold in terms of dwelling density as the site includes just 2 dwellings. It also does not have a diverse thermal demand, in that there are no non-residential activities at the site and the high standards of fabric performance will result in a low thermal demand density.

5 Be Green

5.1.1 In line with Policy 5.7 of the London Plan, renewable energy technologies have been assessed with a view to determining their applicability in optimising generation potential at the Site.

5.1.2 Table 4 below indicates the renewable energy resources that are available and the technology that can provide either heat or electricity or both.

	Resources	Electricity	Thermal
Zero Carbon	Solar	Photovoltaic panels	Solar thermal collectors
	Wind	Wind turbines	-
	Biomass	CHP	Biomass boilers / CHP
Low Carbon	Ground	-	Ground source heat pumps
	Air	-	Air source heat pumps

Table 4 Low and zero carbon resources

5.1.3 As they are not recommended for the site, Solar Photovoltaic, Solar Thermal, Biomass Heating, and Wind Turbine analysis is shown in Appendix D.

5.2 Ground & Air source resource

5.2.1 Ground & Air Source Heat Pumps (ASHPs) take a low grade heat resource (air) and increase the temperature through a vapour compression cycle. Heat pumps can deliver this heat source typically at a co-efficient of performance of 2 to 4.5, meaning that for each kilo-Watt hour of electricity consumed by heat pump 2 - 4.5 kWh of useable heat is delivered. To use the ground or air temperature as the heat source, single or communal units are installed outside of a building. Following compression heat is transferred to heat distribution system. This technology suits steady low temperature applications and is therefore suited to underfloor heating and well insulated buildings. A key advantage is that the cycle can be reversed to provide cooling negating the requirement for additional cooling equipment.

Criteria for ASHP

- ✓ Requirement for heating and cooling;
- ✓ Ability to use low temperature heat distribution for space heating

Criteria for Ground Source Heat Pumps

- ✓ Available area for boreholes

Commentary & viability Air Source Heat Pumps

5.2.2 This technology is considered applicable at the site as this can provide the heating and hot water demands and can be deployed in this Conservation Area, providing the external unit is sensitively located. Modelling indicates this will also allow the development to meet the 35% improvement in emissions in line with the London Plan.

5.2.3 The drop in emissions achievable from this technology is shown in figure 2 below.

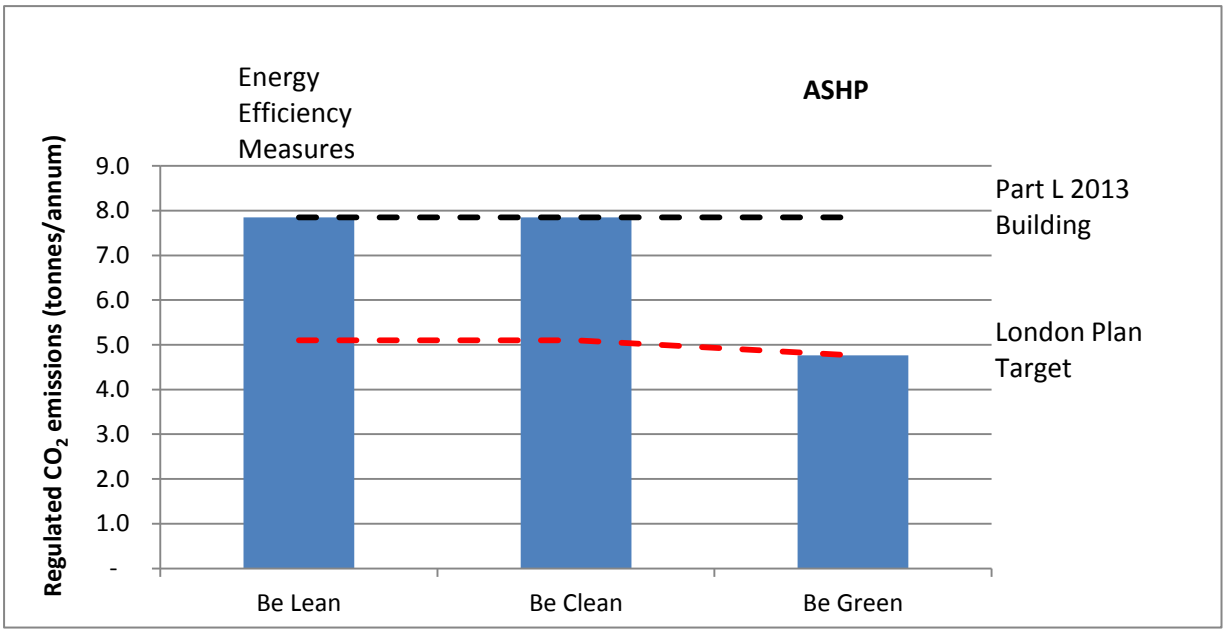


Figure 2 Energy Hierarchy

Commentary & viability Ground Source Heat Pumps

5.2.4 Ground source heat pumps are also considered suitable for the site as the heat collector could be deployed beneath the building. This technology would also allow for a better performance than ASHPs but would however be more costly.

5.2.5 There is also a long term emissions benefit through both these technologies as the fuel source electricity will become less carbon intensive as the grid decarbonises.

6 Conclusion

6.1.1 Two residential dwellings were modelled using SAP and based on drawings received for the proposed development. The output of this software allowed the assessment of whether the building specification chosen achieved compliance with both the Target Emissions Rate (TER) and Target Fabric Energy Efficiency (TFEE) of Part L of the Building Regulations 2013. Compliance with Building Regulations was assured as specifications used were those detailed in Part L of Building Regulations. The output of this software allowed for an estimate of total site energy consumption and emissions to be calculated.

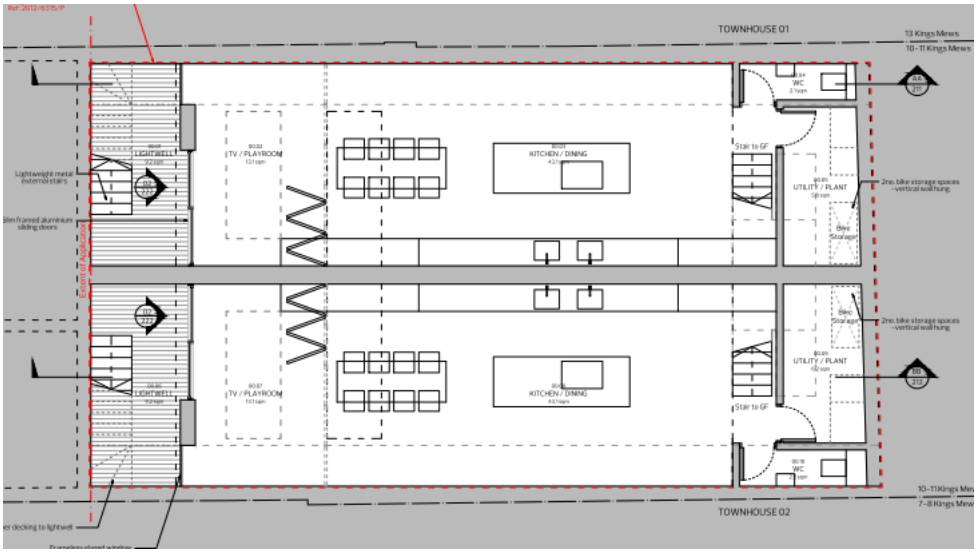
6.1.2 Currently there are no existing or planned heat networks in close proximity to the development. The proposed development is also below the threshold of 300 units recommended for an on-site CHP unit.

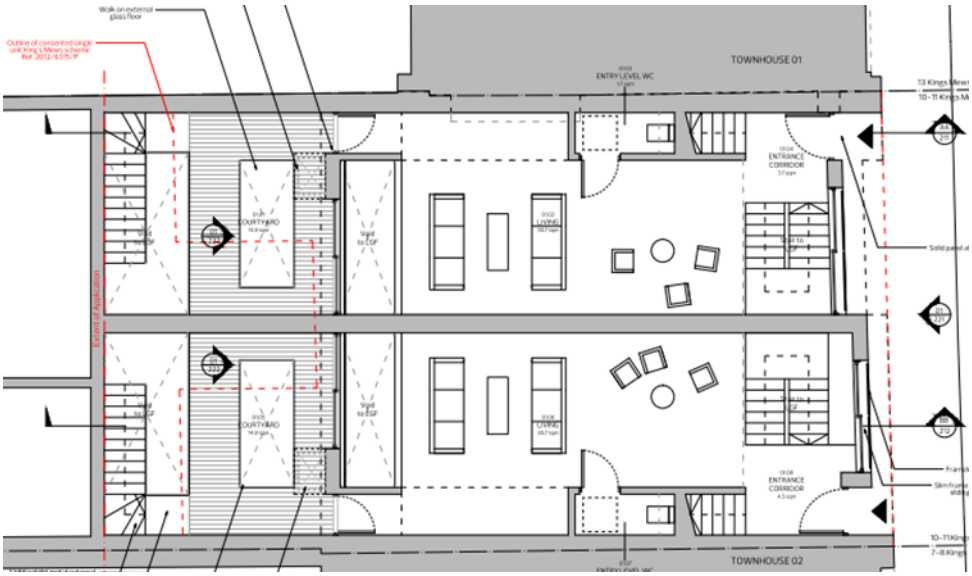
6.1.3 Following the modelling, the target for a 35% reduction in CO_2 emissions against a Part L compliant baseline across the development, was found to be 5.1 tCO_2 per annum.

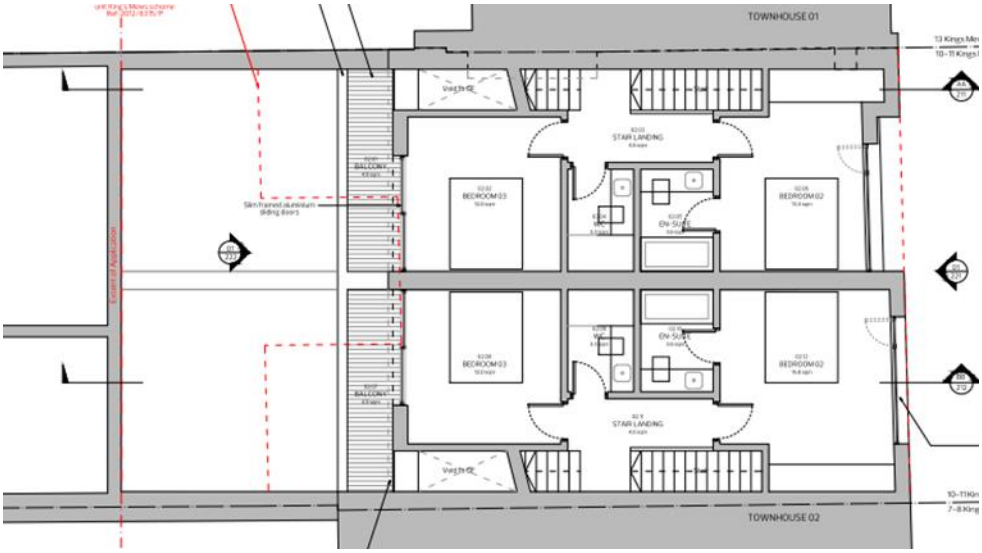
6.1.4 An assessment was carried out in order to outline which technologies could be included in design in order to meet the London Plan requirements of 35% reduction in carbon emissions above compliance with Part L of the 2013 Building Regulations. Air Source Heat Pumps are considered applicable at the site given the level of heat demand at the development, modelling through SAP using a reasonable system indicates a 39% saving.

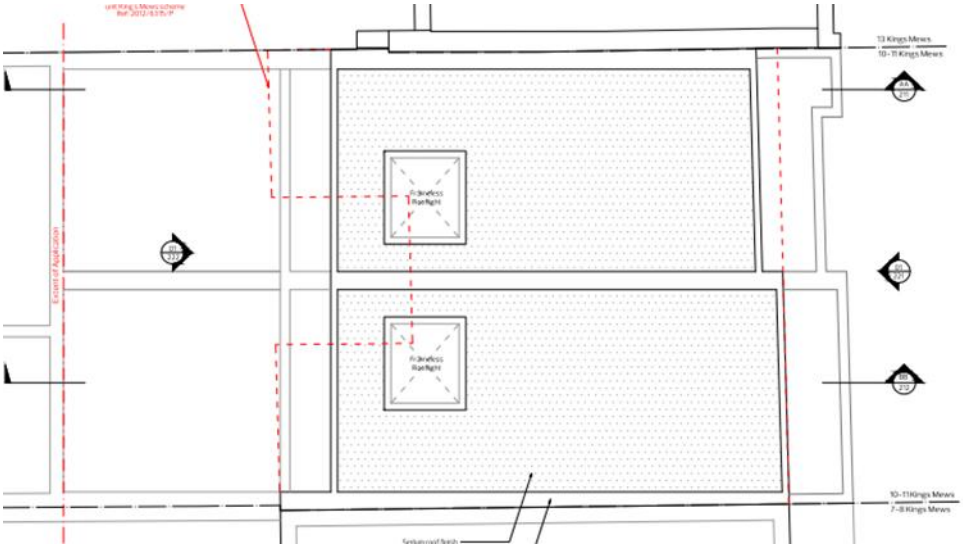
Appendix A

Drawings






TOWNHOUSE 01
BEDROOM 03
BEDROOM 02
EN-SUITE
STAR LANDING
BALCONY
TOWNHOUSE 02


13 Kings Mews
10-11 Kings Mews
Rooflight
Rooflight
10-11 Kings Mews
7-8 Kings Mews

Schedule of Accommodation

Areas _ Townhouse 01

	GIA		Amenity	
Level	sqm	sqft	sqm	sqft
LGF	65.3	702.0	9.2	98.9
GF	38.5	413.9	19	204.3
1F	39.8	427.9	4.9	52.7
2F	37.7	405.3	6.8	73.1
Total	181.3	1949.0	39.9	428.9

Areas _ Townhouse 02

	GIA		Amenity	
Level	sqm	sqft	sqm	sqft
LGF	66	709.5	9.2	98.9
GF	39.3	422.5	17.5	188.1
1F	42.2	453.7	4.9	52.7
2F	40.6	436.5	5.9	63.4
Total	188.1	2022.1	37.5	403.1

Total Areas

	GIA		Amenity	
Level	TOTAL SQM	TOTAL SQ FT	sqm	sqft
LGF	131.3	1411.5	18.4	197.8
GF	77.8	836.4	36.5	392.4
1F	82	881.5	9.8	105.4
2F	78.3	841.7	12.7	136.5
Total	369.4	3971.1	77.4	832.05

EXISTING AND PROPOSED AREAS

Appendix B

These are the values proposed to be achieved for the development.

Fabric Performance

Building Element.	(Notional)
External Walls (W/m^2K)	0.18
Floors (W/m^2K)	0.13
Roof (W/m^2K)	0.13
Window (W/m^2K)	1.4
Openings %	25% of floor area
Thermal Bridging	0.05
Air Permeability (m_3m^2h)	5
Ventilation	Natural

Appendix D

The following technologies were not considered feasible at the site;

Solar Photovoltaics:

Though technically feasible given available roof area and solar resource, planning constraints serve to discourage the development of this technology. The proposed development lies within the Bloomsbury Conservation Area.

Solar Thermal:

Though technically feasible given the availability of roof area and thermal demand planning constraints serve to discourage the development of this technology at site. The proposed development lies within the Bloomsbury Conservation Area.

Biomass Heating:

The size of development does not have sufficient heat demand to warrant the inclusion of this technology. The use of this technology would also be discouraged as it lies within an Air Quality Management Area (AQMA) and because of the additional requirements for fuel delivery vehicles and storage.

Wind Turbines:

Building integrated wind turbines are generally not recommended due to lower wind speeds in urban areas. The noise and visual impacts of turbines of this scale mean that they would need to be sited a significant distance from residential properties which is not possible on a site of this size.

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