AGAR GROVE

SUSTAINABILITY AND ENERGY ASSESSMENT

DECEMBER 2013

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Document prepared on behalf of the London Borough of Camden (Applicant) by:

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Agar Grove Estate Redevelopment

Planning Energy & Sustainability Report

Planning Issue

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1.0 EXECUTIVE SUMMARY

This development is the largest community investment programme currently being undertaken in the borough and as such should be an exemplar in a number of ways and go beyond the baseline planning requirements.

The development design is 'Be lean' in its approach; Carbon emissions will be reduced primarily by implementing 'passive' energy efficiency measures to reduce the demand for energy rather than meet a larger demand with renewable sources.

We described the Passivhaus standard and how it is not only more onerous in its efficiency targets, but also more rigorous in its application, than conventional SAP-led design. This will deliver enhanced 'be lean' performance.

We investigate the requirement for connecting to local heating networks and expect it to be neither technically nor economically feasible. (See appendix A9).

Further heavy investment beyond the regulated minimum will be made in the design of the block-by block communal heating system. The heat efficiency of district heating is not measured by SAP and hence is often highly inefficient (up to 80% losses). We will invest significantly in an enhanced design and specification to reduce these losses to the economic minimum (around 30%). This is also 'be lean' beyond the required minimum.

We will provide heat via a block by block heating system (see appendix A2 for a diagram). Block-by-block heating runs at lower temperatures and pressures than a district heating system. This means that the system can be efficiently run and cheaply maintained (hence more economically sustainable).

Block by block heating allows the connection of solar thermal panels, which cannot be sensibly connected to district heating.

This development is being built over the next 10 years. Block by block heating allows the plant to be sized appropriately to that phase, district heating will required installation of a full size energy centre in the first phase, which leads to inefficiencies.

Block by block systems will each have tee'd tails running to a man hole in the ground adjacent to the base of each riser. This will allow simple future connection to local district heating if it becomes available in the future. The route from street to manhole will be reserved.

The Be Lean fabric and services measures reduce the regulated carbon from around 396 to 344 tCO_2/yr. Column B; Be Clean: CHP; shows no further improvement as CHP is not required for this site by the GLA. The rooftop PV and solar thermal arrays reduce the CO_2 to approximately 268 tCO_2/yr, or an overall reduction of 32%.

Providing better homes and community regeneration and social sustainability is at the heart of this project. These are difficult to measure and communicate. The sustainability matrix aims to achieve this through setting a number of targets covering a wide range of sustainability criteria from energy and water to materials, waste, management and biodiversity, and health and quality of life.

An initial matrix of issues specific to the Agar Grove Regeneration has been presented on the following pages. We have indicated in blue the target ranges for the project; the majority are in the innovative level with some moving into Pioneering. These apply primarily to new build housing and the overall masterplan.

The design team are aiming to achieve Passivhaus Standard on all of the new plots, and Code for Sustainable Homes Level 4, and are aiming for BREEAM Domestic Refurbishment 'Excellent' on the refurbished Lulworth.

Some specific targets include investigating the use of a green concierge onsite to help residents make best use of their new homes, including reading and understanding their smart meters to reduce unregulated energy use, and help with encouraging allotment use. Camden would also like to investigate using renewable heat incentive and feed-in-tariff revenues to provide a community investment fund.

The sustainability matrix sets a number of targets and can be used as a briefing and communication tool.

An initial matrix of issues specific to the Agar Grove Regeneration has been presented. We have indicated in blue the target ranges for the project. These apply primarily to new build housing and the overall masterplan.

2.0 INTRODUCTION

This Report is submitted in support of a planning application by the London Borough of Camden ("the applicant") for the redevelopment of the Agar Grove Estate in Camden.

Agar Grove Estate was constructed by the London Borough of Camden in the 1960s and comprises 249 residential units; two small retail units; and community facilities. The Estate consists of a series of low / medium rise blocks of flats and an 18 storey tower (Lulworth House) along with areas of open space and surface car-parking.

The site is centrally located in the borough to the east of Camden town centre in a predominantly residential area which comprises a mix of period housing; post-war municipal estates; 20th century in-fill; and some remnants of light-industrial activity.

To the east lies Camley Street which is occupied by low rise light-industrial units. Beyond Camley Street lies the mainline railway into St Pancras and then the 1960s Benson and Forsyth Maiden Lane Estate which is also undergoing refurbishment as part of the Council's estate programme. Further to the south-east is the Kings Cross development area.

To the south is the London Overground railway line beyond which sits a pocket of low rise late 20th century housing. To the west is a predominantly residential area heading back towards Camden town.

The Agar Estate Regeneration project forms part of Camden's 'Community Investment Programme' (CIP) which aims to generate investment, deliver new homes and regenerate neighbourhoods. A detailed description of the application proposals is provided in the Design and Access Statement. Key aspects of the brief include:

- Demolition of 112 existing homes (the low rise element of the existing estate), comprehensive refurbishment of Lulworth House (currently an 18 storey tower block) and creation of 493 new homes (circa. 2444 net increase of homes)
- High sustainability standards and a 'fabric-first' approach to increase energy performance. The design team are aiming to achieve Passivhaus Standard on all of the new plots and are aiming for CfSh level 4 on new build and Breeam Domestic Refurbishment 'Excellent' for the refurbished Lulworth House. If successful Agar Grove would be the largest Passivhaus scheme in the UK.
- Mix of tenures to include private, shared ownership and social rent as well as some non-residential uses (local shop/café/community/business space)
- Improved urban design, maximising use of the site for housing, promoting accessibility and improved usable green space
- Scheme to generate a capital receipt for investment into Camden's housing stock
- Improvements / refurbishment of Lulworth which will be retained
- Landscaped open and amenity spaces to support the development and contribute towards the creation of a high-quality environment.

This report describes how the report meets the requirements of the London Borough of Camden and the Greater London authority planning policy.

The proposed net internal area of new build residential 25,769m^2
The proposed net internal area of refurbished residential 11,013m^2
The proposed area of commercial use class is

Block B	455m^2	Class B1, 464m^2 Class D
Block G	64m^2	Class A
Block JKL	100m^2	Class A

This is 1324m^2 in total, equating to 3.6% of the total NIA.

As the non-residential areas are relatively small and a small proportion of the total floor area on the site, we will build this area to best practice and in line with building regulations L2A. We do not propose to assess this area under BREEAM as each component of the non-residential use falls below 500sqm.

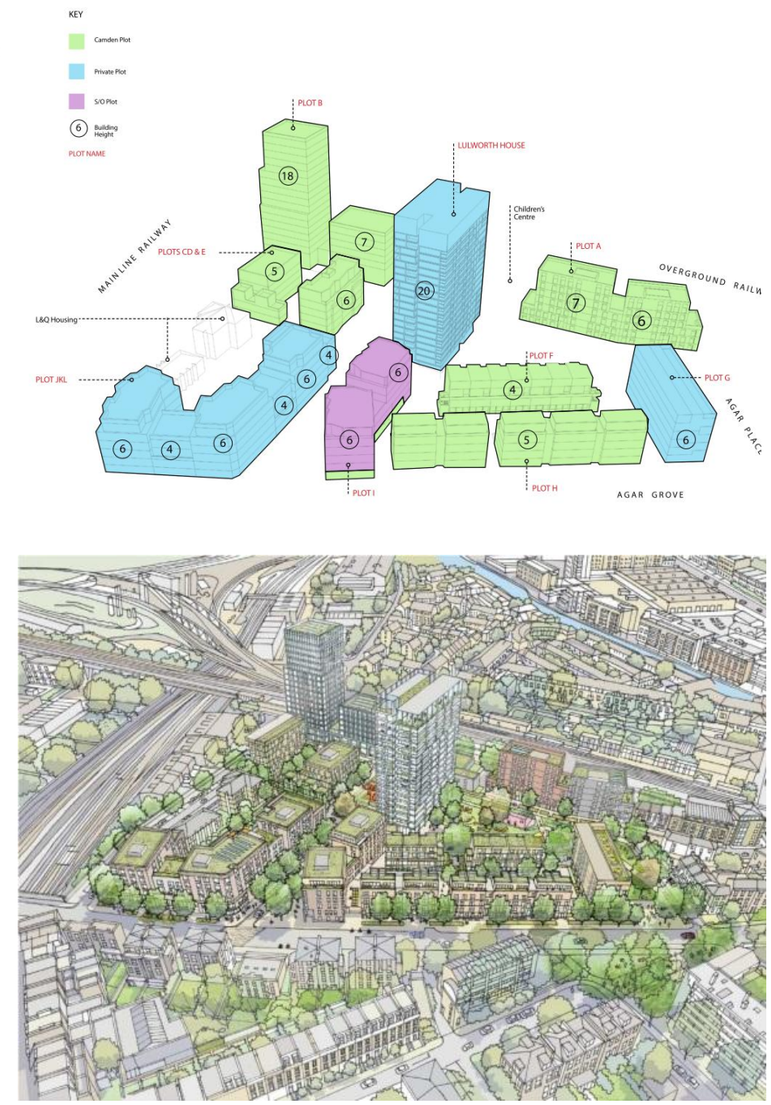

Figure 1 – Architect's Image of the Current Proposed Development

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3.0 POLICY CONTEXT

3.1 Policy Context National

National Planning Policy Framework (NPPF) was released in March 2012; this replaced all national planning policy statements and guidance. The document formalised a presumption in favour of sustainable development, and sets out the requirement to provide for much needed new homes.

3.2 Policy Context: Regional

The London Plan (2011) is the overall strategic policy document forming part of the statutory Development Plan for Greater London. It sets out the London-wide policy context within which London boroughs should set their detailed local planning policies. It also forms the policy framework for the Mayor's own decisions on the strategic planning applications referred to the Greater London Authority.

Policy principles in the London Plan 2011 that are relevant to this report include:

5.1 Climate change mitigation
5.2 Minimising carbon dioxide emissions
5.3 Sustainable design and construction
5.7 Renewable energy
5.8 Innovative energy technologies
5.9 Overheating and cooling
5.11 Green roofs and development site environs
5.12 Flood risk management
5.13 Sustainable drainage
5.14 Water quality and wastewater infrastructure
5.15 Water use and supplies
5.18 Construction excavation and demolition waste
6.1 Strategic transport approach
6.9 Cycling
6.10 Walking
7.14 Improving air quality
7.15 Reducing noise and enhancing soundscapes
7.19 Biodiversity and access to nature

London Plan Policy 5.2
Development proposals should follow the Energy Hierarchy:

1. **Be Clean: use less energy**
2. **Be clean: supply energy efficiently**
3. **Be green: use renewable energy**

The overall CO_2 emissions the development is expected to achieve are presented below:

CO_2 emissions level new dwellings are expected to achieve	
2010 – 2013	25% improvement over Code Level 4 minimum energy standard (40% improvement over 2010 Part L Levels).
October 1st 2013-2016	40% improvement over Code Level 4 minimum energy standard (40% improvement over 2010 Part L Levels)

Table 1 – London Plan Policy 5.2 CO2 emission standards

Non-domestic buildings should also achieve 40% improvement over 2010 Part L Levels.

Figure 2 - The London Plan 2011 and The Mayor's Sustainable Design & Construction SPG documents

3.3 Policy Context: Local

Camden has the following Development Policy documents relevant to the project:

DP22 Promoting sustainable design and construction
The Council expect new build housing to meet Code Level 4 by 2013; and refurbished developments are encouraged to achieved achieve "Excellent" in EcoHomes assessments from 2013; Non-domestic developments (> 500sqm of floorspace) to achieve "Very good" in BREEAM assessments and "Excellent" from 2016. (Note Ecohomes has been replaced by Breeam Domestic Refurbishment).

Developments should be resilient to climate change: include appropriate adaptation measures, such as: summer shading and planting; limiting run-off; reducing water consumption; reducing air pollution;

Developments should demonstrate how sustainable development principles have been incorporated.

Scheme	Minimum rating	Minimum standard for categories (% of un-weighted credits)
Code for Sustainable Homes	Level 4	• Energy 50% • Water 50% • Material 50%
BREEAM Domestic Refurbishment	'Excellent'	• Energy 60% • Water 60% • Materials 40%
BREEAM	'Excellent'	• Energy 60% • Water 60% • Materials 40%

Table 2 - Supplementary Planning Guidance CPG3 Sustainability Assessment schemes rating requirements

DP24 Securing high quality design
The Council is committed to design excellence and a key strategic objective of the borough is to promote high quality, sustainable design. This is not just about the aesthetic appearance of the environment, but also about enabling an improved quality of life, equality of opportunity and economic growth.

Supplementary Planning Guidance CPG3 Sustainability

Energy requirements

- Where new London Plan carbon reduction target in policy 5.2 cannot be met onsite, Camden may accept the provision of measures elsewhere in the borough or a financial contribution which will be used to secure delivery of carbon reduction measures elsewhere.
- Any development proposing electric heating (including heat pumps) will need to demonstrate the carbon efficiency of the proposed heating system. System specifications and calculations will need to be provided to demonstrate CO2 savings over a gas fuelled heating system.
- The Council will be supportive of schemes that aim to Passivhaus standards, subject to other policy and design considerations.

Decentralised energy networks and combined heat and power:
Where feasible and viable developments must connect to a decentralised energy network or include CHP. Where there is more than one occupier, use or building a community heating network is expected.

Renewable energy
Developments should target a 20% reduction in CO_2 emissions from on-site renewables. The SPG provides specific guidance on each renewable – each should be considered in detail:

- Solar thermal: larger schemes should use a central system.
- PVs: preference is for panels to be flush to the roof or wall, but considerations will include the efficiency of the panel/s and whether they are visible.

Sustainable use of materials

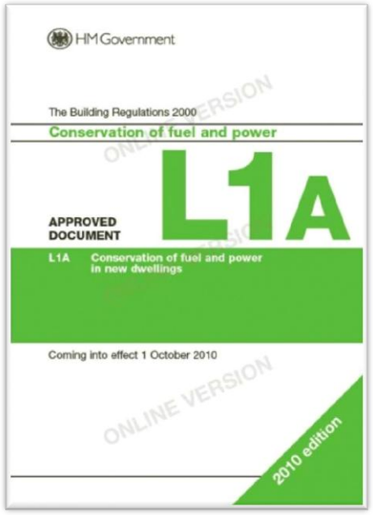
- Reduce waste by firstly re-using your building,
- Major developments are anticipated to be able to achieve 15-20% of the total value of materials used to be derived from recycled and reused sources.
- From the outset, new buildings should be designed for future deconstruction.
- Incorporation of a 'material salvage phase' for recovering construction materials is encouraged

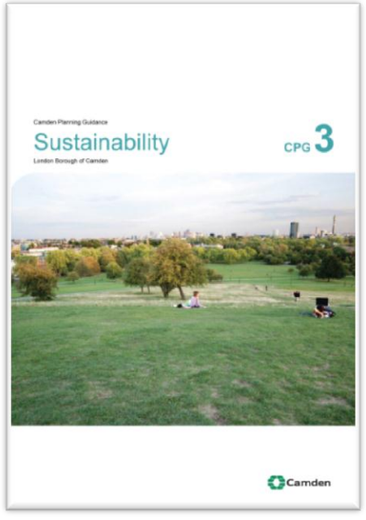
3.4 Buildings Regulations

Part L 2013 will come into force in April 2014. A decrease overall in the CO_2 emissions limit has been confirmed at 6% with respect to 2010 levels. New fabric energy efficiency standards (FEES) will also be introduced, and a new version of the Standard Assessment Procedure (SAP); the full methodology is yet to be released.

Dwellings in existing elements: Building Regulations Part L1b (2013)
The exact requirements of Part L 2013 Building Regulations are not yet known but are expected to be similar to that of Part L1b 2010. Part L1b (2010) sets out the minimum performance standards for refurbished dwellings. A threshold U-value is given for each element of the building. If the existing fabric exceeds any of these figures, the corresponding element must be upgraded to the target value.

Where a thermal element is replaced it should comply with the minimum requirements of Part L1a.





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4.0 RESPONSE TO THE ENERGY HIERARCHY

Agar Grove reduces the energy demand even further than the extremely tough full FEES target. We have produced what we believe to be the ultimate 'Be lean' design in line with the energy hierarchy. The heat is generated centrally to each block, which allows easy future connection to district heat when required, yet it also reduces the losses inherent to district heating. Free solar heat is collected for hot water use to further offset the remaining losses.

- The building fabric is built to the Passivhaus standard. The fabric specification is even more advanced than the very challenging FEES standard. Not only that but it is also designed more rigorously and inspected and tested more thoroughly during construction.
- Block by block gas boilers. This allows a lower systems temperature, and shorter pipe runs, hence reduced losses. It also allows local thermal storage which allows inclusion of solar thermal hot water. The systems are installed for each phase, in each phase. This improves plant size –to-load ratio and hence overall efficiency.
- Solar thermal panels offset the heat losses from the district heating, and provide some domestic hot water in the summer. The solar thermal array covers approximately 27% of the roofs.
- The internal heat distribution design assumed for this scenario is to the advanced standard; details were provided in the pre-application pack and can be supplied on request. SAP does not assess the losses from district heating and hence it is commonly poorly designed and commissioned, which leads to losses of up to 80%. Agar Grove will make a significant investment to reduce losses from the 60% losses commonly observed in practice, down to approximately 35% losses. However even this expensive, enhanced design is underestimated by SAP, which assumes just 5% losses.
- PV array to boost total reduction by renewables to 32% reduction in Carbon from part L 2010, as modelled at design stage. The PV array is approximately 1600m^2 in total and covers approximately 26% of the roofs in the development.
- For the reasons described above, and elsewhere in the report, our confidence is high that the actual carbon/energy use at Agar Grove will be close to the modelled carbon/energy use, and far lower than a similar scheme designed to SAP.

4.1 The target emissions rate for building regulations part L1A 2010

A robust set of calculations has been carried out in order to determine the carbon emissions and savings on Agar Grove.

The target emissions rate for the development is taken as the baseline scenario. In order to determine the Target Emissions Rate (TER) for the development, a sample flat was modelled in SAP 2009. An edge flat on an intermediate floor of Plot A was chosen as it was the most common type of flat, and was thought to be a good representation of the other flats on the development. The TER value output by SAP 2009 is the emissions rate required to meet Building Regulations Part L1A. The TER is given in kilograms of CO_2 per square metre, so the resulting TER value for the sample flat has been multiplied up 'pro-rata; to estimate the emissions for the whole site. The TER for Agar Grove is 15.46kgCO2/m^2.

In order to meet Code 4, the Dwelling Emissions Rate (DER) must improve on Part L 2010 by 25%. Therefore, in order to meet Code 4, the DER for Agar Grove must be reduced to 11.6kgCO2/m^2.

In order to meet the London Plan 2013 target for carbon emissions, the DER must improve on Part L by 40%. This requires a development-wide DER of 9.3kgCO_2/m^2.

To meet the LBC target for renewables, a 20% reduction in carbon emissions must be achieved using renewable energy sources.

4.2 The dwelling emissions rate for building regulations part LA 2010

The total site emissions were calculated using the DER from the sample flat, before any renewable technologies had been added. This DER was found to be 13.42kgCO_2/m^2. This value was multiplied by the total dwelling floor area for Agar Grove to give the site emissions. Dwelling floor areas for each plot were obtained from architect's schedules (net internal areas were used). The resulting site emissions were found to be 345,000 kg of CO_2 (before the addition of any measures to offset this carbon).

Photovoltaic (PV) panels and solar thermal collectors have been added to the scheme in order to offset the site emissions.

Solar thermal collectors have been sized and added to meet the standing losses from district heating from spring to autumn, and provide some domestic hot water in the summer. In order to provide this energy, an average of 2.7m^2 of collector per dwelling is required. These collectors are sized at 2m^2 and 3m^2, depending on which block they are sited. The overall solar thermal array covers 27% of the roofs. This amount of solar thermal offsets 34,000 kg of carbon.

The PV array has been sized to obtain the maximum possible carbon offset for the remaining available roof space. Available roof space limits the improvement that can be achieved on Agar Grove. Much of the roof is not ideal for solar technology due to overshading from the site's two high-rise buildings. There is also competing demand for amenity and biodiversity.

The results of these calculations are summarised below in the format defined by Energy Planning, GLA Guidance on preparing energy assessments, September 2011.

Table 1 from GLA guidance		
	Solar thermal and PV scenario	
Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
Area, m2	25,625	
	PHPP scheme	
	Carbon dioxide emissions (Tonnes CO 2 per annum)	
		Regulated
Building Regulations Part L 2010 Compliant Development	A	396
After energy demand reduction	B	344
After CHP	C	344
After renewable energy	D	268
	Regulated Carbon dioxide savings	
	(Tonnes CO2 per annum)	**(%)**
Savings from energy demand reduction	52	13
Savings from CHP	0	0
Savings from renewable energy	76	22
Total Cumulative Savings	128	32
From GLA document "GLA Guidance on preparing energy assessments" September 2011		

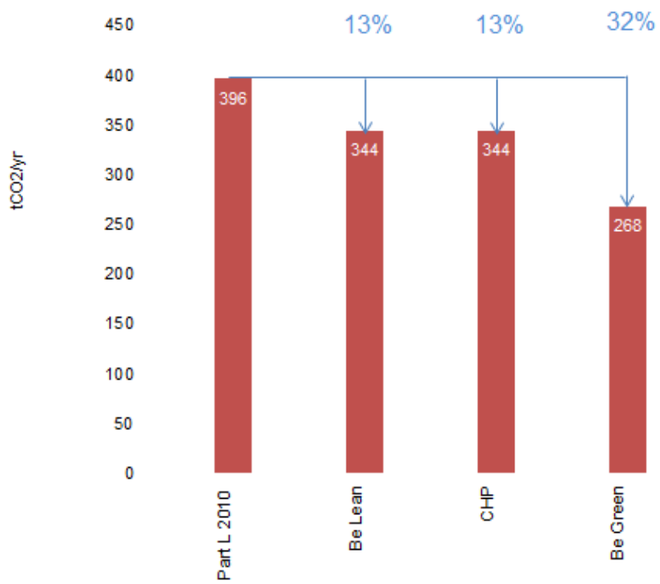

Figure 3 - CO_2 savings achieved by Agar Grove in design.

The environmental strategy for an indicative flat is illustrated in Figure 4.

The 'Be Lean' savings are achieved by building fabric design to Passivhaus standard. CHP is not included, so no savings are made here. The omission of CHP has been confirmed acceptable by Jonathan Williams of the GLA on 24/10/2013 (see appendix A9).

The 'Be Green' savings are achieved by using solar thermal collectors to offset standing losses from communal heating, and using PV panels to generate renewable energy for use on-site.

The final calculated emissions value for Agar Grove is 288 tCO_2 per annum, compared to the London Plan target of 238 tonnes (Part L + 40% improvement). The design for Agar Grove has achieved Part L plus 32%. While this falls short of the London plan requirement of 40%, it is the maximum possible for this site, given the limitations of the roof area and competing design agendas.

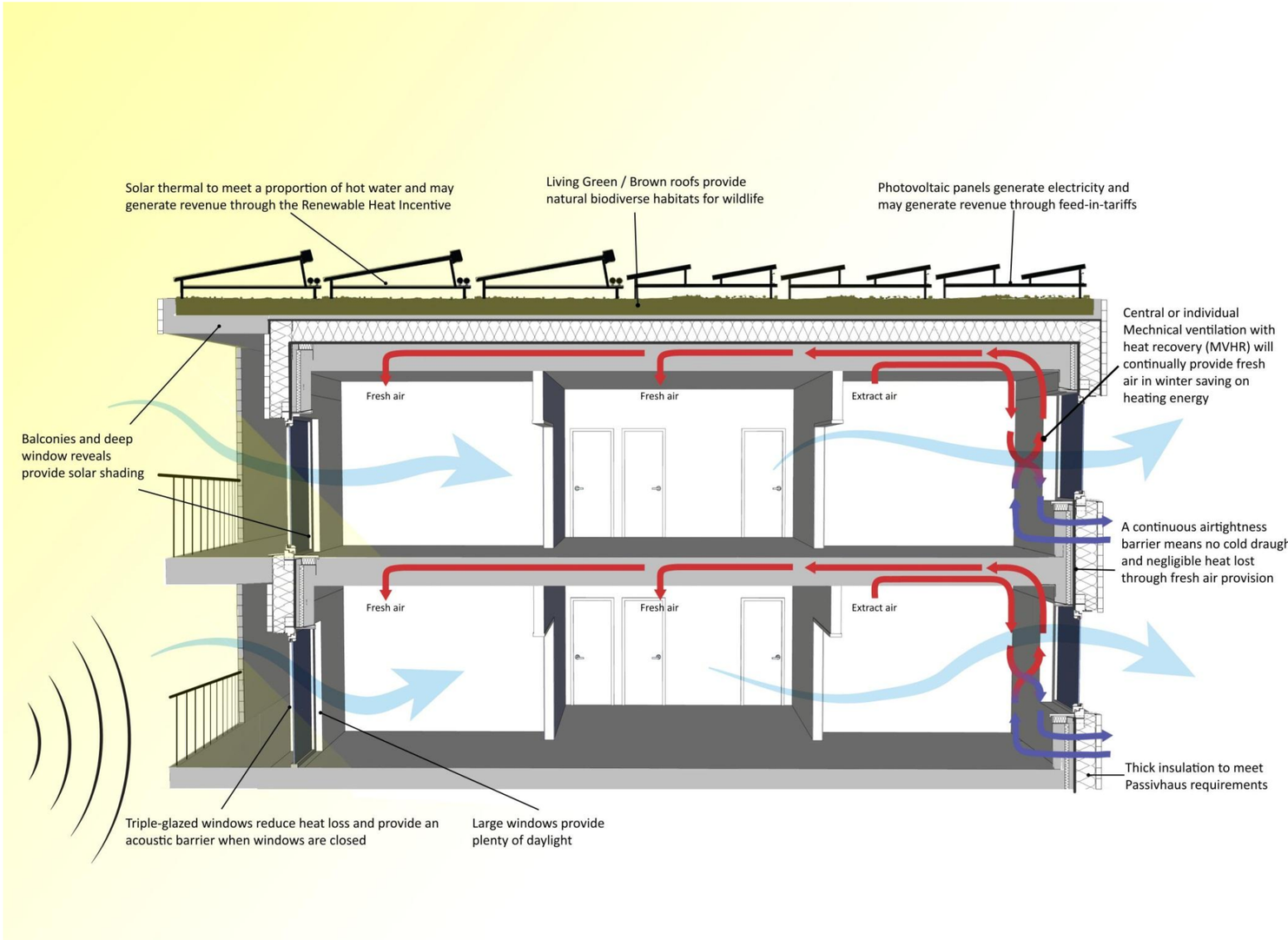

Figure 4 - Illustration of environmental strategy concepts applied to the new build dwellings. It should be noted that both communal and individual MVHR systems are proposed; an individual unit MVHR system is shown here.

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4.3 The energy hierarchy: Be lean: use less energy

Carbon emissions will be reduced primarily by implementing 'passive' energy efficiency measures to reduce the demand for energy rather than meet a larger demand with renewable sources.

The approach for new build will be a Passivhaus approach.

Camden's aspirations for Agar Grove regeneration

- Exemplar: This development is the largest community investment programme currently being undertaken in the borough and as such should be an exemplar in a number of ways and go beyond the baseline planning requirements.
- Low carbon: the council is committed to a reduction in borough-wide carbon by including an interim 27% reduction target by 2017 towards the 40% by 2020 target set out in Green Action for Change.
- Cost effective: the CIP should demonstrate that CO_2 is being reduced in the most cost effective way across the borough. See appendix A3 for this comparison.
- Tackle fuel poverty: Fuel poverty should be a primary consideration as part of the energy strategy and reducing tenants' bills is of higher priority over other sustainability issues measured by the Code.
- Easy to use: The design should try to limit the number of new unfamiliar mechanical equipment incorporated into dwellings.
- Given the aspirations above, there is a strong case for pursuing the Passivhaus standard.

As a means of reducing CO_2 in the borough it is felt by the design team and the Council that Passivhaus provides:

- Better design and build quality and rigorous on-site compliance checking
- Smaller performance gap than relying on approved Building Regulations calculations – heating demand is usually as predicted due to rigorous quality control
- Most appropriate standard to address fuel poverty with efficient appliances required in addition to efficient systems
- Higher level of confidence in low resident bills well into the future
- High levels of air quality through mechanical ventilation in winter and natural ventilation in summer.
- Higher comfort due to increase surface temperatures and no draughts
- Good summer comfort conditions
- Passivhaus concentrates on energy reduction through good design, construction and testing, as opposed to low carbon via offsetting with renewables as would be required for Code 5 or Code 6
- Avoids technical risk of not being able to achieve Code 5 or 6 in high rise blocks due to limited roof area
- Although the capital cost of Passivhaus is higher, this is the cost of a higher quality building, which is borne out of in the pay back/neutrality over a 50 year scenario. See appendix A3 for this comparison.
- Exemplar scheme in the UK if delivered on a large scale

Confidence in low energy in practice

An energy usage calculation for compliance is not the same as predicted tenant energy consumption. The energy consumed in practise rarely matches that predicted by a design stage energy models produced for a regulatory compliance check. This is due to a number of reasons but largely down to the behaviour of the occupants compared to the model; occupation hours and internal temperature preferences vary significantly, people use additional appliances, systems are often not installed, commissioned or subsequently maintained properly and, the build quality can be inadequate. A report on the energy performance of dwellings built to 2006 regulations notes "*few are even remotely close to the predicted value and none are lower than predicted".* There is currently much interest on reducing this 'performance gap'[1]; the Zero Carbon Hub have recommended that by 2020, the 'as-constructed' performance of 95% of all new dwellings should achieve the required design standard.[2]

It is recognised that Passivhaus is better at delivering low energy in use than the SAP and the Code methodology. This is in part because it is much more rigorous in its requirements for certification in terms of the Passivhaus Planning Package model, the certified mechanical equipment, and the construction detailing. Studies of existing buildings have shown that on average passivhaus dwellings have an average energy consumption equal to that of the compliance calculation. Studies of modern low energy dwellings showed overall energy use to be typically 60% higher than that of the compliance calculation.

Why Passivhaus and why now?

- UK energy prices have risen by almost 34% since February 2008
- More and more people are finding it unaffordable to keep their home warm as fuel prices rise faster than incomes
- This is having a major effect on the health of the very young and the elderly, in particular
- People in fuel poverty spend a disproportionate amount of their income on energy for heating, lighting, and cooking in their homes. Over 10% of their income is spent on energy
- For those on fixed incomes, like many council tenants, the issue is becoming critical
- Camden's planning policy includes provisions to ensure that new homes are energy efficient
- Our policy is to use less energy by wasting less
- Agar Grove aims to achieve a 75% reduction in space heating requirements, compared to standard practice for UK new build (Code 4), and in so doing realise a significant reduction in residents' energy bills
- This is achieved by super insulating the building fabric and making it exceptionally airtight
- The simplicity of the concept, the low maintenance requirements and the elimination of fuel poverty are the driving forces behind this innovative council scheme
- We hope to set new standards in public housing, both here and in future council developments

Comparison between the Code for Sustainable Homes and Passivhaus

The two standards can be applied together however there is a difference in the energy requirements and calculation methodologies. These are summarised here:

Code for Sustainable Homes

- Covers a range of sustainability issues beyond energy
- At Levels 4 and 5 often requires the addition of design elements that might not be central to the design intent such as high levels of cycle parking and energy display devices
- Uses the same energy calculation methodology (Standard Assessment Procedure - SAP) as required by Building Regulations
- Dwellings have been found to use more energy than anticipated due to a number of reasons including occupant behaviour and preferences, misunderstanding over controls and inadequacy in the SAP methodology in predicting various aspects of energy consumption. On-going tenant/leaseholder training and engagement will be required to ensure energy in use is not significantly higher than expected

Passivhaus

- Considers only energy use
- Needs to be assessed in addition to a Code or BREEAM assessment
- Uses different methodology than SAP including in calculating floor areas
- Smaller performance gap than under the Code – energy consumption is usually as predicted
- Onerous design requirements to achieve required levels of fabric energy efficiency
- On-going tenant/leaseholder training and engagement will be required to ensure air quality is maintained

[1] The Performance Challenge, Zero Carbon Hub, 2013, http://www.zerocarbonhub.org/resourcefiles/ZCH_Performance_Challenge.pdf
[2] A review of the modelling tool and assumptions. Closing the Gap between Designed and Built Performance, Zero Carbon Hug August 2010

- Improved comfort conditions
- Better design and build quality and rigorous on-site compliance checking

The Passivhaus Assessment at Agar Grove
The technical challenge of achieving Passivhaus should not be underestimated. Passivhaus is not yet well established in the UK, so skills and products are not so readily available.

The formal certification requirements of Passivhaus are as follows:

Criteria	Passivhaus Standard
Specific Heat Demand	≤ 15 kWh/m²/yr
Specific Cooling Demand	≤ 15 kWh/m²/yr
Primary Energy Demand	≤ 120 kWh/m²/yr
Air permeability limiting value	≤0.6 air changes per hour at n50
Summer Comfort	< 25°C for <10% of hours
Minimum Internal Surface Temperature	>17°C (lower surface temperatures cause convection driven drafts; this target avoids this allowing all parts of the building, even those adjacent to windows to be used)
Ventilation	30m³ per person per hour (needed to provide fresh, healthy air to building occupants)

Table 3 – Passivhaus Certification Requirements

Passive energy savings: on regulated loads will be achieved by a number of energy saving initiatives such as:

- The provision of high thermal performance by means of increased insulation and triple glazed window systems to reduce heat loss
- Close attention will be paid to detailing to avoid thermal bridging of insulation in the building fabric
- Air-tight construction techniques such as a dedicated air barrier in the envelope to minimise unwanted air infiltration, certified air-tight windows and post completion air-pressure testing to ensure compliance with design standards
- Reducing summertime overheating by controlling solar gains by balanced window sizes, internal blinds, external movable shutters, balcony shading or solar control glass where necessary. This avoids requirement for electric cooling
- Adequate sized windows for good even daylighting – this improves the 'feel' of a room, and also reduces electrical lighting use
- Heat recovery ventilation system- efficient mechanical ventilation with heat recovery (MVHR). Higher investment as Passivhaus certified unit, currently centrally located serving many flats to reduce losses and increase efficiencies. This has the added advantage that maintenance can be provided without requiring access to the apartment- which is often a major flaw of MVHR vented social housing
- Water saving measures such as spray taps. Water use will be less than 105 l/person/day, as assessed by Code for sustainable homes Wat1 calculator. This will save water and heating fuel
- Light controls in corridors and low energy light fittings
- Energy A-rated appliances will be used to save on energy and water
- Simple, well understood (by installer and user) and robust mechanical and electrical services. The block-by-block arrangement of plant rooms especially assists with this when compared to a site wide district heating scheme: the smaller scale allows simple low pressure and low temperature systems
- Time and zoned temperature-controlled heating using controls which are easy to use
- Generously sized pipes and ducts, variable speed controls, weather compensated controls, all to minimise pump and fan power

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Fabric standards
Table 4 shows the proposed fabric standards to achieve the 'Be lean' standards, in relation to those of the 2006 Notional Building. The TER itself is a 40% reduction on the challenging 2006 target. The reduction achieved by Be lean measures is 15% from this tough target.

U-values	Reference values for part L1A 2010 Notional building (Appendix R SAP calculation)	Proposed values for Agar Grove new build
Walls	0.35 W/m^{2}K	0.1-0.2 W/m^{2}K
Floors	0.25 W/m^{2}K	0.10 W/m^{2}K
Roofs	0.16 W/m^{2}K	0.10 W/m^{2}K
Opaque door	2.00 W/m^{2}K	1.20 W/m^{2}K
Windows and glazed doors	2.00 W/m^{2}K	0.85 (Whole window value)
Air permeability	10 m^3/m^{2}h at 50 Pa	0.6 ACH at 50Pa
Thermal bridging	No limit	Very good detailing: virtually thermal bridge free y=0.03 W/K

Table 4 - Proposed building fabric for the development in comparison with the 2006 notional building

Unregulated loads
The reduction of un-regulated loads (cooking and appliances) is difficult to achieve through building design alone. Education and awareness can influence the behaviour of residents to save energy. This development's contribution to awareness will be:

- A well drafted simple user guide to the home, which will give incentives and tips on how to save energy.
- Smart meters which provide live feedback of energy use to encourage frugal energy use.
- Consideration is also being given to a green concierge to help tenants understand their homes and provide ongoing support.

4.4 The energy hierarchy: Be clean: supply energy efficiently

The passive carbon saving measures have been set out above. The next step in the hierarchy is to save carbon with Be clean measures; appropriate selection of mechanical and electrical systems. A major consideration here is the choice of heat source. This could be generated individually or communally. If the heating is communal then a CHP (combined heat and power) plant can become feasible. These options are assessed below.

4.5 Feasibility of decentralised energy

The London plan 2011 **Policy 5.2: minimising carbon dioxide emissions** states: Major development proposals should select energy systems in accordance with the following hierarchy:

1. Connection to existing heating or cooling networks (Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool)
2. Site wide CHP network
3. Communal heating and cooling.

Connection to existing heating or cooling networks
The heat map shows that the closest district heat source or network to the site is the Maiden Lane estate. The boiler house for this estate is 700m away from Agar Grove, a route which requires crossing a major railway line (and land safeguarded for works associated with HS2). The boiler house has no capacity for expansion. A summary of this assessment is contained in Appendix A9

- The next closest is King's cross Argent development, which is 1km away as the crow flies. The route requires crossing 2 railway lines. The estimated connection cost to Kings Cross Central is £1.4m. This includes energy centre base build construction, infrastructure, back up boilers, thermal stores and substation.

This is a significant sum; we estimate this would add 1.9p per kWh to the price of heat for the residents for the life of the system, solely to meet the initial capital cost. The London Plan 5.38 allows a measure of financial feasibility to be considered, we do not expect this connection to be financially feasible. For the above reasons it is not currently proposed to connect to a local network.

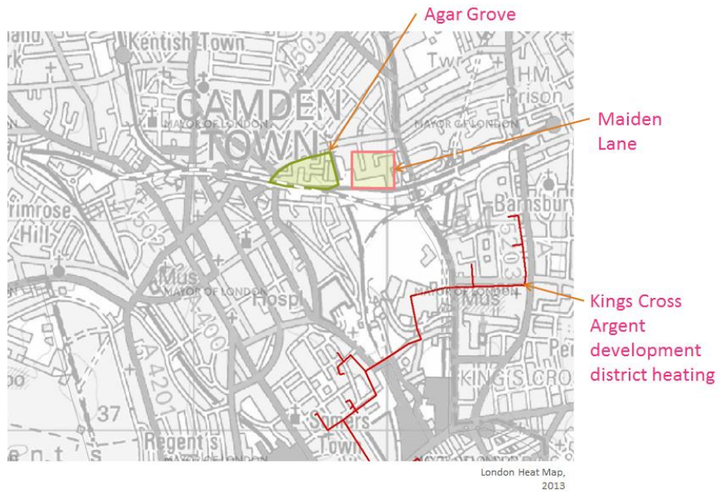

Figure 5 - Local area extract from http://www.londonheatmap.org.uk

Site wide District heating & capability for future connection
The whole estate will be heated by district heating which has the capability to connect to district heating in the future, in line with the London Plan.

Each block will be heated by gas boilers located in a plant room on the roof. (Refer to appendix A2 for a schematic). High efficiency condensing gas system boilers will generate low temperature hot water (LTHW). The heat will be distributed to individual apartments via an LTHW distribution system. Highly insulated, carefully detailed and carefully installed flow and return pipes will deliver the heat to a heat interface unit (HIU) in each apartment. An HIU is a wall mounted box which contains heat exchangers, valves, controls and heat meters to deliver the required space heating and hot water to the apartment. At the base of each block will be pipe tees to allow connection to district heating in the future. This meets the London plan requirement for future-proofing.

The project will be delivered over a number of phases, a centrally supplied system would be physically difficult to deliver in phase 1 and deliver sufficient homes to meet the demand. The plant would need to be therefore be housed from a temporary plant location. This would be likely to increase construction disruption for residents and it would be a number of years before the systems would be operating at designed efficiency. During consultation residents have also expressed strong objections to a central system.

However a block-by-block system will instead be installed for each phase, in each phase. This improves efficiency. This system allows a lower system temperature, and shorter pipe runs, hence reduced losses. It also allows local thermal storage which allows inclusion of solar thermal hot water. Solar thermal is more carbon efficient than PV as demonstrated in the next section.

Considerable investment will be made into the LTHW distribution pipes, pumps and controls (refer to the appendix A3 for a description of how this is proposed to be done). It will be insulated and will run at a low temperature with variable volume pumps in order to minimise non-useful heat losses. The internal heat distribution design assumed for this scenario is to the advanced standard; details were provided in the pre-application pack and can be supplied on request. This is a significant investment to reduce losses from the 60% losses commonly observed in practice, down to approximately 35% losses. However even this expensive, enhanced design is underestimated by SAP, which assumes just 5% losses.

Onsite combined heat and power (CHP)
In line with the GLA guidance for energy assessments, September 2011, Be Clean savings are defined as only those savings from CHP.CHP has been considered and found to be unsuitable for this site. The GLA has confirmed that this development is not large enough to warrant requirement of CHP given the predominantly residential use. This has been confirmed by Jonathan Williams of the GLA on 24/10/2013 (see appendix A9). So, no Be Clean savings are achieved. This is also presented, for completeness, in Graph 1.

Communal heating and cooling.
The next stage of policy 5.2 hierarchy is communal heating and cooling. This is provided by the block-by-block communal LTHW heating systems. This improves efficiency & allows use of solar thermal as described above. The Solar thermal panels offset the heat losses from the district heating, and provide some domestic hot water in the summer. The solar thermal array covers approximately 26% of the roofs.

The internal heat distribution design assumed for this scenario is to the advanced standard described in the appendix. This is a significant investment to reduce losses from the 60% losses commonly observed in practice, down to approximately 35% losses. However even this expensive, enhanced design is underestimated by SAP, which assumes just 5% losses.

Future proofing
Should district heating become available in the locality in the future, the GLA require a simple connection to be available. This is readily achievable as each block is heated by a single LTHW system with easily accessible pipe tails at the base of each riser ready for future connection. [These tails are connected to an external manhole, so connection in the future is simply a matter of connecting the road to the man hole.] As a council development achieving access to a future district system would be easier to implement than for a private development. See appendix A1 for a site plan.

CHP and district heat summary
In summary;

- The GLA have allowed that CHP is not required for this scheme.
- Argent will be contacted to investigate connection to the Kings Cross network; it is not expected to be financially viable. Feasibility of connection to Maiden lane is addressed in appendix A13.
- A connection to local heat networks is not proposed at this stage.
- All apartments are fed from a communal heating system, heated by solar thermal and gas boilers on the roof of each block. See A2 for a site plan.
- Should district heating become available in the locality in the future, the GLA require a simple connection to be available. This is readily achievable as each block is heated by an LTHW system. See appendix A1 for a site plan.

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4.6 The energy hierarchy: Be green: use renewable energy

The following section evaluates a number of possible renewable energy sources.

Wind technologies

Figure 6 - Wind turbines in urban environment

The power in the wind and the energy output of a wind turbine are proportional to the cube of wind velocity. It is therefore preferable to install wind turbines in areas where wind speed is high and, ideally, frequently above around 5m/s.

Power in the wind = 0.5 x density of air x Area x Velocity^3

Wind speed, in general, increases with height. Wind at height is undisturbed and therefore different from local wind. The mean wind speed in lower heights is dependent on the local environment such as topography, ground, roughness, obstacles e.g. built up areas etc.

Small scale wind turbines which could potentially be installed in urban areas - as opposed to their bigger counterparts - do have the disadvantage that buildings and obstacles interfere with the wind flow. Since the energy output is very much dependent on the wind speed it is not efficient to install wind turbines in urban areas where nearby buildings cause turbulence. There are other issues with regard to the installation of turbines in cities such as noise nuisance or flickering effects caused by the blades in the setting sun. Some roof mounted turbines can generate noise through structure-borne vibration.

Building-mounted wind turbines have been shown to be problematic (e.g. Palestra building in Elephant and Castle) this is due to acoustic and structural vibration control issues which are inherent to wind turbines. For these reasons we are not proposing building mounted turbines.

Based on a desk-top study of the site, wind shading from the tall buildings on site and the low average annual wind speed in London, small scale wind turbines have been discounted as a viable solution for making deep cuts in carbon emissions.

Biomass and Biofuel

The handling and burning of biomass requires large amounts of space and plant. Wood chips have lower energy content than fossil fuels per unit volume. The typical energy content of wood is 15 MJ/kg versus 43 MJ/kg for heating oil. It is therefore necessary to provide a large chip-storage area from where the chips are fed in the burning chamber. The smaller the available storage room, the more often the wood chips need to be refilled, which requires 30 tons, semi-articulated lorries. For this reason individual biomass or biofuel boilers are not considered feasible for central London schemes such as this.

Furthermore, and specific to bio fuels;

- Burning natural gas produces some NOx but very few PM10 particulates. Biofuel combustion can generate unwanted levels of the above, which is contrary to the clean air act, and to the following extract from the London plan policy 5.6: “the design of such systems should also seek to minimise impacts on air quality (see Policy 7.14).”

- Transporting to the inner city by lorry and the handling of large volumes of bulk biofuel is a key management issue for the developer. We don’t believe it is a sensible use of resources, especially when the fuel is oven dried pellet fuel from Scandinavia, as it sometimes is! Anecdotal evidence suggests that the biofuel boiler is often installed then switched off so the building runs on the back up gas boilers.

- There is a limited resource of biomass locally. According to the Forestry Commission’s report ‘A Wood fuel strategy for England’, biomass can deliver just 2% of the national heat demand.

- Biofuel is higher energy density fuel that is closer to oil in ease of handling and transportation. Therefore this fuel is more suited for use in transportation where there are far fewer fuel alternatives than for buildings.

For these reasons we have excluded biomass & biofuel as a feasible option for this development.

Photovoltaic Panels

An alternative solar energy collector is a Photovoltaic (PV) array. A PV panel converts the sun's energy directly into electrical energy. PV panels could be mounted on the flat roofs at a 10° inclination facing south. A 10° inclination has been chosen because it gives the largest energy output per m^2 roof area, while allowing for panel self cleaning. This inclination is also preferred in Camden's SPG 3.

Based on the communal gas boiler strategy, a PV array is required on the roof of each apartment block (2.8m^2 per apartment) to achieve the CO_2 emissions required to reach the minimum energy for Code Level 4. If the PV array were sized to only meet Code 4, the carbon offset would be 8% of regulated carbon.

The roof strategy has been optimised for renewable technology and amenity. As much solar thermal has been installed as is efficient, and the remaining suitable space for PVs has been filled. The roofs also provide amenity for the residents.

In order to further minimise the carbon emissions of this development in line with the aspiration of the London Plan 2013, given the limitations of the roof area, a maximum site wide 13% reduction on the Be Lean development through the addition of around 930m^2 of PV site wide has been identified.

The savings from the Be Green measures are presented in table 5.

Figure 7 - A typical rooftop photovoltaic array

PV array	
Typical efficiency of PV panel	156Wp/m^2
PV array area per apartment, minimum to achieve Code 4	1.5m^2
Proposed PV area per apartment	2.8m^2
Total site array	975m^2
Proportion of annual regulated electricity by PV	63%
Carbon savings	40 kg CO_2
Carbon savings	10% of regulated carbon emissions

Table 5 - Size of the proposed solar photovoltaic array.

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Solar thermal

Solar thermal panels are designed to collect solar energy and transfer it as heat to increase the temperature of water flowing within the panel. The hot water is distributed directly to a storage tank where it heats up water for hot water provision. Conventional boilers back up the system for when the solar energy is not sufficient enough to provide the required temperature level.

Solar Thermal is a good solution for a residential project in London since it targets a significant energy demand and when mounted horizontally has little visual impact. In general there are two systems of solar collectors: evacuated tube collectors and flat plate collectors (see right). The former exhibits a greater efficiency as heat loss through convection and radiation is reduced to a minimum through the vacuum inside of the tubes. Flat plate collectors hold a lower efficiency and temperature level but are more favourably priced.

Comparison of the efficiency of solar thermal and PV

A typical vacuum tube solar thermal panel is approximately 50% efficient. A typical PV panel is approximately 13% efficient. However, the electricity that PV panels generate has about twice the carbon intensity of the heat from a thermal panel. In other words; from a thermal panel we get four times as much energy of half the carbon intensity. So, can we expect the carbon offset per m^2 of a thermal panel to be about twice of that of a PV panel? We look at some numbers from SAP using a typical Agar Grove apartment.

For $2m^2$ of PV panel:

SAP input: $2m^2$ of PV, 0.26kWp, mounted horizontally (in fact 10 degrees) orientated South, 'modest' overshading.

SAP output: electricity generated 160 kWh(elec)/yr, multiplied by 0.53 $kgCO_2$/kWh(elec) =

<u>85 $kgCO_2$ offset per year</u>.

For $2m^2$ of Solar thermal panel:

SAP input: $2m^2$ of solar thermal evacuated tube mounted at 30 degrees (the panel is mounted horizontally, but the individual tube collectors are rotated), orientated South, 'modest' overshading.

SAP output: heat generated 611 kWh(heat)/yr, divided by boiler efficiency of 0.85, gives a gas saving of 719 kW(gas)/yr, multiplied by 0.198 $kgCO_2$/kWh(gas) is 142 $kgCO_2$/yr.

From the gas savings we must subtract the extra electricity required for pumping. The default value for this is 75 kWh(elec)/yr per apartment, multiplied by 0.53 $kgCO_2$/kWh(elec) is 40 $kgCO_2$/yr

So the total carbon saving for 2m2 of solar thermal is 142-40 =

<u>102 $kgCO_2$ offset per year.</u>

Figure 8 - Evacuated tubes and flat plate collectors

This demonstrates that solar thermal is expected to be more carbon efficient than PV, not by a factor of 2 as suggested but approximately 1.2. Solar thermal is not sensibly compatible with site wide district heating but it is compatible with block-by-block heating. This also supports the proposed block-by block heating system.

The solar heat is stored centrally per block in the roof top plant room (See appendix A2 for a simplified schematic) and is delivered to each apartment as part of a block LTHW (low temperature hot water) heat network. The solar thermal collection goes some way towards offsetting the heat lost in the distribution system.

Solar thermal panels offset the heat losses from the district heating, and provide some domestic hot water in the summer. The solar thermal array covers approximately 27% of the roofs.

Solar thermal panels are sized to meet the summer hot water load, which is around $2.7m^2$ per dwelling. This is expected to contribute around a 10% reduction of annual CO_2. This contributes to the CO2 reduction for Code Ene1, and the renewables proportion for code Ene7. This is the limit that solar thermal panels can contribute- if the panels were sized any larger they may overheat in the summer, which is damaging to the system.

Photovoltaic (PV) panels on the other had produce electricity which is simply delivered to the whole block. Furthermore any excess of electricity during the summer can be released efficiently to the grid. For these reasons there is no technical limitation on PV array size.

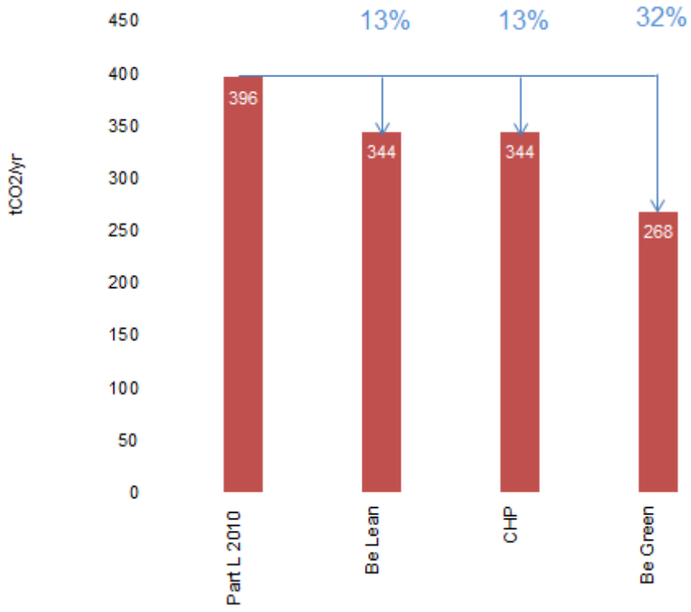
Solar thermal arrays	
Type of panel	Evacuated tube
roposed area of panel per flat	$2.7m^2$
Total area site wide	$930m^2$
Volume of storage per flat	75 ltrs Stored centrally within each block
Carbon savings	36 tonnes CO_2
Carbon savings	10% of regulated carbon emissions

Table 6 - Description of solar thermal array

5.0 SUMMARY OF ENERGY STRATEGY

5.1 Energy hierarchy CO_2 emissions summary

The Be Lean fabric and services measures reduce the regulated carbon from around 396 to 344 tCO_2/yr. Column B; Be Clean: CHP; shows no further improvement as CHP is not required for this site by the GLA. The rooftop PV and solar thermal arrays reduce the CO_2 to approximately 268 tCO_2/yr, or an overall reduction of 32%.



Graph 1 - A presentation of the carbon savings achieved by the development. All figures are generated using the SAP 2009 calculation v.9.90. The communal gas boilers are 92% efficient and the distribution efficiency used is 95%, which is the default SAP value for district heating.

Notes:

1. *Saving over TER*
2. *Saving over Be Lean*
3. *Saving over Be Clean*
4. *Cumulative saving over TER*

Level of energy hierarchy	Whole site regulated CO_2 emissions	Saving of regulated CO_2 at each level	Saving of regulated CO_2 at each level %	London plan target % reduction
TER	396 tCO_2/yr	-	-	-
Be Lean	344 tCO_2/yr	52[1] tCO_2/yr	13[1]%	-
Be Clean [CHP]	344 tCO_2/yr	0[2] tCO_2/yr	0[2]%	-
Be Green	268 tCO_2/yr	76[3] tCO_2/yr	22[3]%	20[3]%
Total	268 tCO_2/yr	128[4] tCO_2/yr	32[4]%	40[4]%

Table 7 - Carbon savings achieved at each level of the energy hierarchy. These figures are calculated in the manner described by Table 1&2 of the GLA assessment guidance, September 2011

The graph and table above demonstrate how the Be Lean fabric and services on this development have achieved 13% reduction in CO_2 when compared to the challenging Part L1A 2010 minimum. In order to meet the aspirational London Plan requirements, solar thermal collectors and PV arrays will be introduced on the roofs of the blocks. These arrays have been sized to give Code 4 throughout the development as a minimum, and bring about a 32% reduction in carbon emissions from Building Regulations Part L1A 2010.

The onsite renewables proportion is 22%, exceeding the London plan target of 20%.

Non-domestic energy summary

The non-domestic areas form a very small part of the overall area of the site. They will be designed to meet Part L 2013 standards. All will form part of the same building envelope as the residential buildings. As such they will be to high fabric and construction standards. High efficiency services will be installed, and the spaces have been designed to allow for natural cross-ventilation in summer. Control of solar gain in non-residential areas is addressed in Appendix A8. The exact usages are not yet known however if cooling is found to be required it will be supplied with reversible heat pumps so that high efficiency heat can also be provided in winter.

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5.2 Energy strategy conclusion

We have confirmed the planning policy targets. We have confirmed the target CO_2 emissions to pass building regulations, GLA targets and LBC targets.

We have presented how the development design is 'Be lean' in its approach. We described the Passivhaus standard and how it is not only more onerous in its efficiency targets, but also more rigorous in its application, than conventional SAP-led design. This will deliver enhanced 'be lean' performance.

Further heavy investment beyond the regulated minimum will be made in the design of the block-by block communal heating system. We described how the heat efficiency of district heating is not measured by SAP and hence is often highly inefficient (up to 80% losses). We describe how we will invest significantly in an enhanced design and specification to reduce these losses to the economic minimum (around 30%). This is also 'be lean' beyond the required minimum.

We investigated the requirement for connecting to local heating networks and expect it to be neither technically nor economically feasible. (See appendix A13).

We described how all apartments are fed from a communal heating system, heated by solar thermal and gas boilers on the roof of each block. See A2 for a site plan. When compared to a site wide heating system, the block-by-block system allows a lower systems temperature, and shorter pipe runs, hence reduced losses. The systems are installed for each phase, in each phase, unlike in a site wide scheme. This improves efficiency. It also allows local thermal storage facilitating the use of solar thermal hot water. Solar thermal is more carbon efficient than PV.

Should a low-carbon district heating supply become available in the locality in the future, the GLA require a simple connection to be available. This is readily achievable as each block is heated by an LTHW system. See appendix A1 for a site plan.

Site wide CHP has been assessed and found to be unfeasible. This has been accepted by the GLA (see appendix A7).

The 'be green' strategy proposed is a balanced provision of solar thermal panels and PV panels on the roof of each block. Solar thermal panels are shown to be more CO_2 efficient than PV panels. The limited roof area on this high density site has been carefully apportioned, taking overshading into account. This should maximise heat and electrical generation whilst also giving the residents an amount of roof top amenity.

We have demonstrated how the new build portions of the development will achieve Code level 4, including greater than 50% of the energy credits.

The overall site wide regulated carbon reduction is 32% from part L 2010. This is the maximum possible for this site, given the limitations of the roof area. This is very close to the London plan requirement of 40%; the target has been shown to be very difficult to achieve on a predominantly residential, high density development.

The overall site wide CO_2 emissions reduction achieved is 32% from part L 2010 is equivalent to 9% reduction on the Code 4 credit Ene 1.
Pre-application feedback from LBC has indicated that the whole life benefits and improved quality & comfort of Passivhaus should be deemed an acceptable alternative route to Policy compliance.

The onsite renewables proportion is 22%, exceeding the London plan target of 20%.

6.0 CODE FOR SUSTAINABLE HOMES AND BREEAM DOMESTIC REFURBISHMENT STRATEGY

6.1 Code for Sustainable Homes summary

The sustainability assessments for Agar Grove Estate Redevelopment have been split between two methodologies. Code for Sustainable Homes for each of the new build dwellings and BREEAM Domestic Refurbishment for the flats in Lulworth. This report outlines the specific requirements in each case.

When setting a target rating it is advisable to target a score 5% greater than needed so that if credits are lost at a later stage Code level 4 can still be achieved.

A pre-assessment has been undertaken and monitored throughout the design to date. All of the mandatory elements for Code 4 are expected to be achieved, and the expected score is currently **72.25%.** This produces a 4.25% margin in targeting a Level 4.

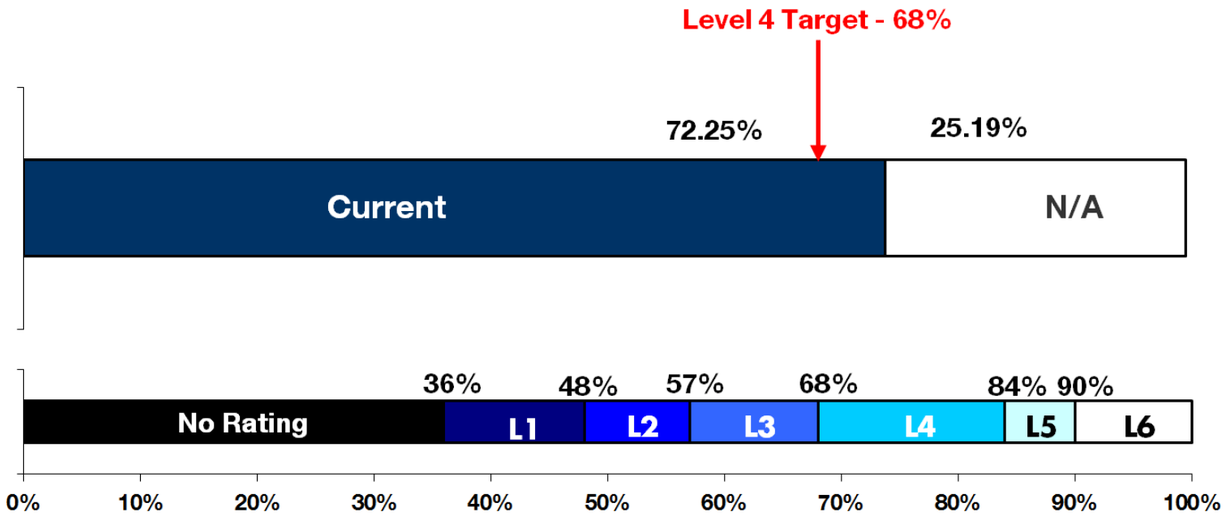
Camden has minimum requirements for standard categories as a % of un-weighted credits. The current scenario for the worst case flat presented achieves the following:

Categories	Camden requirements	Agar worst case	
Energy	50%	64.5%	
Water		50%	67%
Materials		50%	38%

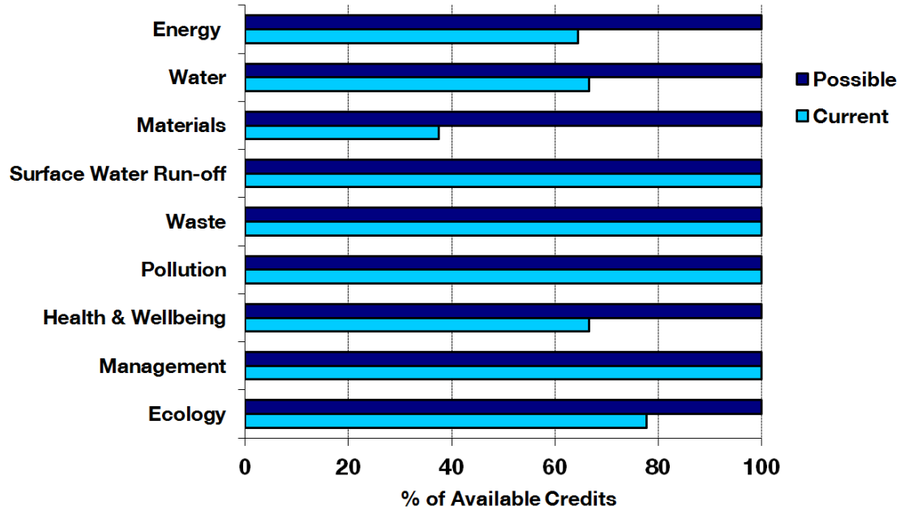
Table 8 - Camden Minimum Code Category Requirements

As can be seen in the above table, the development is expected to surpass the minimum requirement set by Camden policy for Energy and Water sections. However it is expected to fall short of meeting Camden's requirements in the materials section. Before the final design is set it is not possible to know the exact score, however efforts have been made to check this as the project progressed.

One of the reasons for achieving a low score in the materials section is the use of triple glazed windows. Triple glazed windows are being specified due to the pursuit of Passivhaus standards and contribute to the better than average score in the energy section. In this respect, a slightly below par score on materials is understandable; work is being done to improve this score by looking into alternative materials which would still satisfy the design, for example the use of cross-laminated timber is being considered which would increase the Mat 1 points considerably.



Graph 2 - Pre-assessment Code Score



Graph 3 - Pre-assessment score in each

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6.2 BREEAM Domestic Refurbishment of Lulworth House

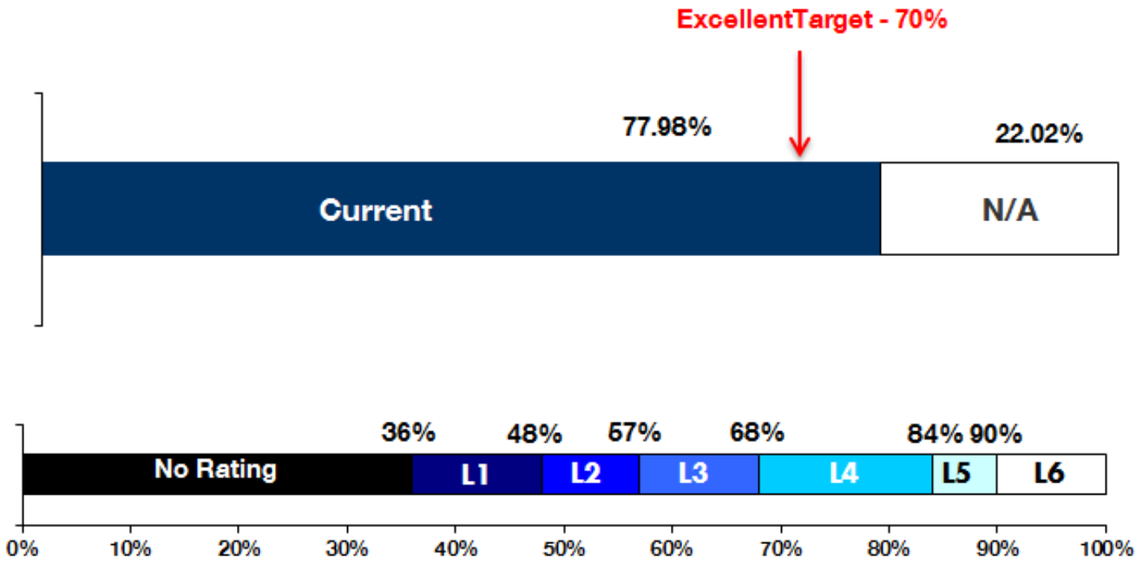
The Code for Sustainable Homes is only used to assess new build projects and cannot be used to assess a refurbishment. The Domestic Refurbishment methodology provides a much more suitable and effective way of assessing the unique requirements brought about by refurbishments. Therefore, the refurbishment of Lulworth House will be assessed under this scheme. Generally speaking, there are many similarities between the two schemes, but the differences that do exist will enable the separate parts of the redevelopment to be assessed more effectively.

A pre-assessment has been carried and monitored. The achievement of these credits would produce a BREEAM score of **77.98%,** an 'Excellent' (where a minimum of 70% is required).

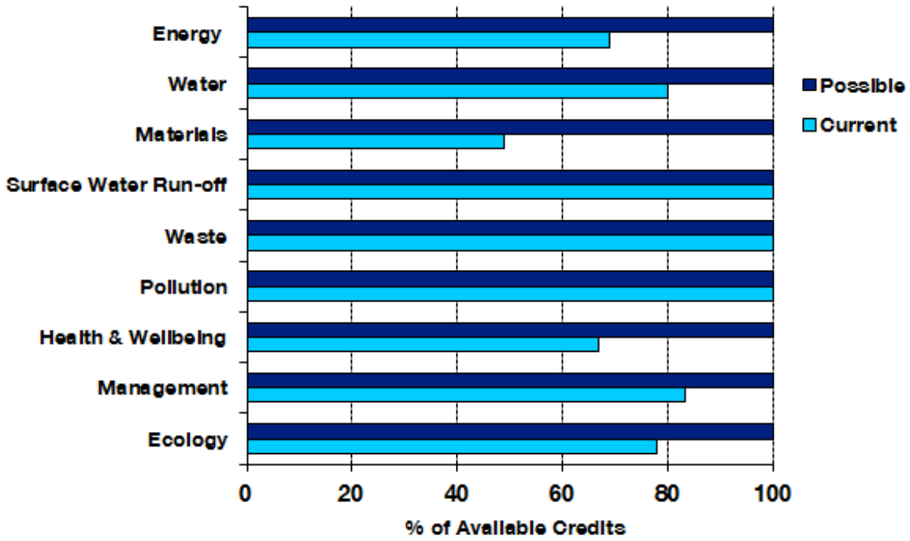
Camden has minimum requirements for standard categories as a % of un-weighted credits. The worst case scenario presented exceeds the minimum section scores in all categories.

Categories	Camden requirements	Agar worst case
Energy	60%	69%
Water	60%	80%
Materials	40%	49%

Table 8 – Camden Minimum Code Category Requirements



Graph 4 – Pre-assessment Breeam Domestic Refurbishment Score



Graph 5 – Pre-assessment score in each section

7.0 WIDER SUSTAINABILITY STRATEGY

7.1 Non-residential elements

There are a small number of non-residential uses on the site. There will be new community centre space as part of B1/B2 and in Lulworth; two retail units; and new business space.

The non-residential elements of the building represent a very small part of the overall floor area and each sits within the building envelope of a larger residential block. Issues such as energy, materials, surface water run-off and cycling facilities provision will be dealt with on a site wide scale.

Because of the relative size and the high aspirations of the project overall in achieving Passivhaus and estate regeneration, Camden do not require the non-residential areas to be assessed under BREEAM as each non-residential element is below 500sqm. This has been agreed with Camden as part of the pre-application process. As these are small spaces and all part of larger buildings and not standalone, it is not proposed to assess them separately under BREEAM.

7.2 The Sustainability Matrix

Background
There are many sustainability issues that are not well represented as part of BREEAM or the Code for sustainable Homes. Particularly in relation to site specific issues around social sustainability and regeneration which are at the core of the scheme.

Max Fordham LLP have developed the Sustainability Matrix 10 years ago in collaboration with Feilden Clegg Bradley Studios, as a framework to present the range of sustainability options available for a project, covering not only the more familiar parameters of energy and water but also wider sustainability parameters.

For each issue (recorded vertically) four standards are set – from minimum (what must be done to comply with national regulation) through best practice to pioneering (what would be really pioneering considering that criteria only). The target levels are recorded horizontally. This is illustrated on the right.

The sustainability matrix sets a number of targets and can be used as a briefing and communication tool.

An initial matrix of issues specific to the Agar Grove Regeneration has been presented on the following pages. We have indicated in blue the target ranges for the project. These apply primarily to new build housing and the overall masterplan.

Some specific targets include investigating the use of a green concierge onsite to help residents make best use of their new homes, including reading and understanding their smart meters to reduce unregulated energy use, and help with encouraging allotment use. Camden would also like to investigate using renewable heat incentive and feed-in-tariff revenues to provide a community investment fund.

The intention is that the sustainability matrix will be continually reviewed and referred to at later stages of the project.

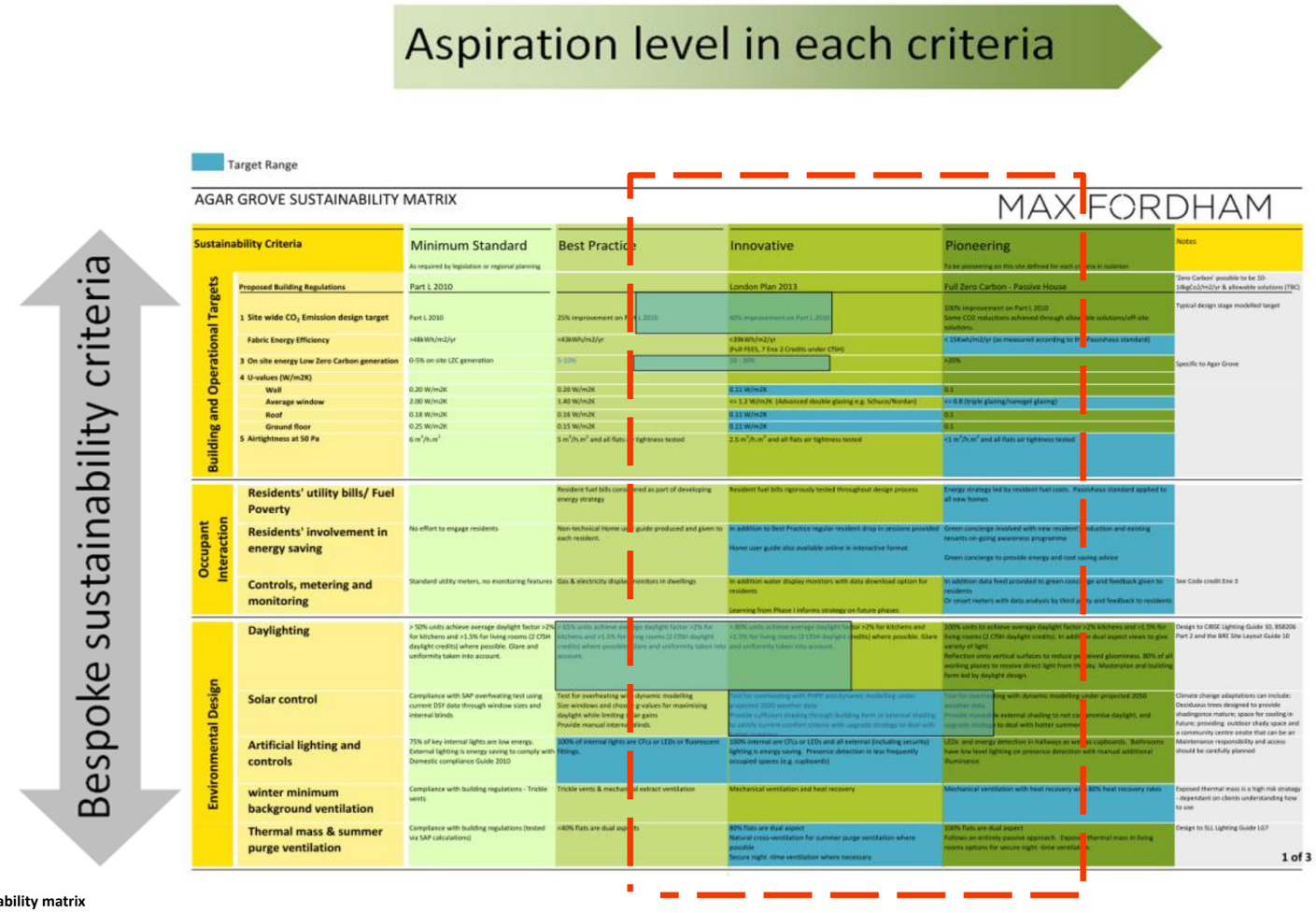


Figure 9 - How to read the sustainability matrix

Target Range

AGAR GROVE SUSTAINABILITY MATRIX

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		Sustainability Criteria	Minimum Standard As required by legislation or regional planning	Best Practice	Innovative	Pioneering To be pioneering on this site defined for each criteria in isolation	Notes
Building and Operational Targets		Proposed Building Regulations	Part L 2010		London Plan 2013	Full Zero Carbon - Passivhaus	'Zero Carbon' possible to be 10-14kgCo2/m2/yr & allowable solutions (TBC)
	1	Site wide CO_2 Emission design target	Part L 2010	25% improvement on Part L 2010 32% reduction	40% improvement on Part L 2010	100% improvement on Part L 2010 Some CO2 reductions achieved through allowable solutions/off-site solutions.	Typical design stage modelled target
		Fabric Energy Efficiency	>48kWh/m2/yr	<43kWh/m2/yr	<39kWh/m2/yr (Full FEES, 7 Ene 2 Credits under CfSH)	< 15Kwh/m2/yr (as measured according to the Passivhaus standard)	
	3	On site energy Low Zero Carbon	0-5% on site LZC generation	5-10%	10 - 20%	>20%	Specific to Agar Grove
	4	U-values (W/m2K)					
		Wall	0.20 W/m2K	0.20 W/m2K	0.11 W/m2K	0.1	
		Average window	2.00 W/m2K	1.40 W/m2K	<= 1.2 W/m2K (Advanced double glazing e.g. Schuco/Nordan)	<= 0.8 (triple glazing/nanogel glazing)	
		Roof	0.18 W/m2K	0.16 W/m2K	0.11 W/m2K	0.1	
		Ground floor	0.25 W/m2K	0.15 W/m2K	0.11 W/m2K	0.1	
	5	Airtightness at 50 Pa	6 $m^3/h.m^2$	5 $m^3/h.m^2$ and all flats air tightness tested	2.5 $m^3/h.m^2$ and all flats air tightness tested	<1 $m^3/h.m^2$ and all flats air tightness tested	
Occupant Interaction	6	Residents' utility bills/ Fuel Poverty		Resident fuel bills considered as part of developing energy strategy	Resident fuel bills rigorously tested throughout design process	Energy strategy led by resident fuel costs. Passivhaus standard applied to all new homes	
	7	Residents' involvement in energy saving	No effort to engage residents	Non-technical Home user guide produced and given to each resident.	In addition to Best Practice regular resident drop in sessions provided Home user guide also available online in interactive format	Green concierge involved with new resident's induction and existing tenants on-going awareness programme Green concierge to provide energy and cost saving advice	
	8	Controls, metering and monitoring	Standard utility meters, no monitoring features	Gas & electricity display monitors in dwellings	In addition water display monitors with data download option for residents Learning from Phase I informs strategy on future phases	In addition data feed provided to green concierge and feedback given to residents Or smart meters with data analysis by third party and feedback to residents	See Code credit Ene 3
Environmental Design	9	Daylighting	> 50% units achieve average daylight factor >2% for kitchens and >1.5% for living rooms (2 CfSH daylight credits) where possible. Glare and uniformity taken into account.	> 65% units achieve average daylight factor >2% for kitchens and >1.5% for living rooms (2 CfSH daylight credits) where possible. Glare and uniformity taken into account.	> 80% units achieve average daylight factor >2% for kitchens and >1.5% for living rooms (2 CfSH daylight credits) where possible. Glare and uniformity taken into account.	100% units to achieve average daylight factor >2% kitchens and >1.5% for living rooms (2 CfSH daylight credits). In addition dual aspect views to give variety of light. Reflection onto vertical surfaces to reduce perceived gloominess. 80% of all working planes to receive direct light from the sky. Masterplan and building form led by daylight design.	Design to CIBSE Lighting Guide 10, BS8206 Part 2 and the BRE Site Layout Guide 10
	10	Solar control	Compliance with SAP overheating test using current DSY data through window sizes and internal blinds	Test for overheating with dynamic modelling Size windows and choose g-values for maximising daylight while limiting solar gains Provide manual internal blinds	Test for overheating with PHPP and dynamic modelling under projected 2020 weather data Provide sufficient shading through building form or external shading to satisfy current comfort criteria with upgrade strategy to deal with hotter summers.	Test for overheating with dynamic modelling under projected 2050 weather data. Provide moveable external shading to not compromise daylight, and upgrade strategy to deal with hotter summers.	Climate change adaptations can include: Deciduous trees designed to provide shadingonce mature; space for cooling in future; providing outdoor shady space and a community centre onsite that can be air conditioned in future and acts as a refuge. See also Design for Future Climate: Adapting Buildings
	11	Artificial lighting and controls	75% of key internal lights are low energy. External lighting is energy saving to comply with Domestic compliance Guide 2010	100% of internal lights are CFLs or LEDs or fluorescent fittings.	In addition all external (including security) lighting is energy saving. Presence detection in less frequently occupied spaces (e.g. cupboards)	LEDs and energy detection in hallways as well as cupboards. Bathrooms have low level lighting on presence detection with manual additional illuminance	Maintenance responsibility and access should be carefully planned
	12	winter minimum background ventilation for energy reduction	Compliance with building regulations - Trickle vents	Trickle vents & mechanical extract ventilation	Mechanical ventilation and heat recovery	Mechanical ventilation with heat recovery with 80% heat recovery rates	Exposed thermal mass is a high risk strategy - dependant on clients understanding how to use
	13	Thermal mass & summer purge ventilation	Compliance with building regulations (tested via SAP calculations)	<40% flats are dual aspects	80% flats are dual aspect Natural cross-ventilation for summer purge ventilation where possible Secure night -time ventilation where necessary	100% flats are dual aspect Follows an entirely passive approach. Exposed thermal mass in living rooms options for secure night -time ventilation.	Design to SLL Lighting Guide LG7

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Target Range

AGAR GROVE SUSTAINABILITY MATRIX

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Sustainability Criteria		Minimum Standard As required by legislation or regional planning	Best Practice	Innovative	Pioneering To be pioneering on this site defined for each criteria in isolation	Notes
Construction Materials	14 **Code for Sustainable Homes Materials credits**	No minimum requirement	50% total Materials section credits (Camden requirement)	75% total Materials section credits	100% total Materials section credits	Highly building specific and metrics not sufficiently standardised to allow benchmarks to be used as meaningful targets. Wise, June 2010, Building.co.uk, "What if everything we did is wrong" 2010, Recycled content measured by value
	15 **Embodied carbon in fabric and recycled and reclaimed content**	Embodied carbon not assessed. 10-15% recycled content likely as standard.	Cement replacements used, e.g. GGBS in concrete. Preference stated for locally sourced materials.	Structure engineered to minimise material mass. Materials specified to be from local sources and provenance checked during construction.	Net-zero or negative embodied carbon through a detailed life-cycle analysis and the specification of a predominantly timber structure.	
	16 **Building and materials re-use**	Future flexibility of buildings considered.	Preference for standard sizes of elements such as steel beams/columns or precast units. High grade materials designed for recyclability E.g. Using lime mortar.	Flexibility of future use demonstrated by typical conversion example designs. Avoid composite materials. Consider fastenings for easy dismantling. Different material layers made identifiable or visible	Flexibility and future use drives design. Label & log or e-tag main elements.	
	17 **Material Toxicity**	Avoidance of ozone depleting materials (e.g. insulation)	Avoidance of high VOC content paints & sealants.	VOC-free paints and sealants. 'C' rated materials avoided and natural materials where possible.	Eliminate PVC. Non petro-chemical based insulation materials >80% of materials 'A' or 'A+' rated	Ratings refer to BRE Green Guide
	18 **Responsible sourcing**	No minimum requirement	4 credits achieved under Mat 2 0 credits achieved under Mat 3	4-5 credits achieved under Mat 2 1-2 credits achieved under Mat 3	6 out of 6 credits achieved under Mat 2 3 out of 3 credits achieved under Mat 3	Responsible Sourcing of Materials Mat 2: Basic Building Elements (6) Mat 3: Finishing Elements (3)
Water	19 **Mains water consumption**	125L/p/day to conform with Building Regulations	105L/p/day	90L/p/day (Minimum requirement for Code Level 4)	80L/p/day (Minimum requirement for Code Level 5)	Saving water through a fittings based approach more CO2 efficient than through on-site water recyling
	20 **Drainage systems**	Carry out Flood Risk Assessment Mandatory Code requirements met: No increase in stormwater run-off including allowance for climate change	Thorough site hydrological characterisation, design responds to environment, including SUDS where appropriate. Rainwater harvesting for irrigation. No increase in stormwater run-off.	Drainage system fully integrated into the environment. No discharge from the site for up to 5mm (Water quality criteria for Code credit Sur 1 met). Rainwater harvesting for irrigation and WCs.	Closed loop water system. Waste-to-Energy plant or alternatives to water based foul drainage.	Highly site specific. Note that onsite water reuse often has a higher CO2 footprint than mains water
Waste	21 **Construction waste minimisation**	Contractor to produce Site Waste Management Plan (SWMP) to identify waste streams and areas for segregation on site or post collection.	Establish waste streams during design, set key KPI's early on. Divert 85% by weight of non hazardous project waste from landfill.	Waste reviews on design team meeting agendas. Account for site conditions impacting waste. Materials logistics plan.	Implement Modern Methods of Construction throughout design. Achieve zero net waste for project.	see WRAP for guidance on SWMP's and waste minimisation strategies
	22 **Waste recycling**	Adequate space for storing recyclable waste.	Managed recycling processes involving space for separating and collecting recyclables.	On site composting for biodegradable waste. Actively encourage occupants to recycle.	Waste stream feeds on or off-site anaerobic digestion for biogas production. Provide incentives for recycling.	
Transport Issues	23 **Low impact transport**	Covered cycle storage to London Plan standards. Increase in parking provision from existing estate	Full cycling support provisions as part of travel plan.	Electric vehicle charging points. Full cycling support provisions as part of travel plan Cycling facilities in line with London Plan No increase in parking spaces. New pedestrian routes created	All dwellings have cycle space to achieve 2 Code credits (ie 1 cycle per bedroom for 1,2 and 4 bed dwellings, 2 cycles per 3 bed dwellings) Cycle encouragement part of community activity programme. Cycle hire scheme docking station on site considered - dependent on size	
Management	24 **Construction site management**	Main contractor has CCS or alternative certification. Energy use in construction metered	Main contractor operates EMS including monitoring and setting targets for energy use	Main contractor has CCS score 25-34 and achieves at least 3 in every section. Energy and water use targets are met and results published	Main contractor has CCS score of 35-40 and achieves at least 7 in every section. A proportion of construction energy is generated on site with temporary renewables.	
	25 **Estate management burden and robustness**	Consider the design lives of the different elements of the development and integrate the considerations into the design	Maintenance costs considered as part as landscape and energy design	Maintenance costs considered as part as landscape and energy design. Regular maintenance reviews	Design strategy led by reducing maintenance costs. Life cycle cost reviews carried out for key decisions	
	26 **Stakeholder involvement and design process**	Use of industry Standards. Standard client briefing.	Early consultation with stakeholders with the declared intention that this may affect design proposals. Stakeholders fully understand standards and design and which comments have been incorporated and why	Open design process with published response to stakeholder proposals. Design strategy tested with stakeholders. New boundaries set.	Capacity building with residents to help them meaningfully engage with the planning process (if necessary). Feed back results into industry standards.	

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Target Range

AGAR GROVE SUSTAINABILITY MATRIX

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Sustainability Criteria		Minimum Standard As required by legislation or regional planning	Best Practice	Innovative	Pioneering To be pioneering on this site defined for each criteria in isolation	Notes
Landscape & Biodiversity	27 **Ecology & Green Space**	Local planning requirements met. Mitigate against negative construction impacts where feasible	Consult an ecologist on biodiversity enhancement, adopt key recommendations - giving preference to local species. Valuable ecological features of site protected where feasible. Integrate landscape and water strategy with landscape management plan. Access to communal green space- either on or off site.	Adopt all ecologist's recommendations to significantly increase biodiversity on site. Linkages provided between habitats (green roofs are connected) Wider microclimate concerns given consideration with deciduous planting to reduce summer urban heat island and internal solar gain where appropriate.	Design for major increase in biodiversity on site. 75% roofs are bio diverse living roofs (EA recommendation) Create new connections to existing habitats All existing trees on site retained	'Zero Carbon' possible to be 10-14kgCo2/m2/yr & allowable Biodiversity is the variety of species within an ecosystem, used as a measure of the health of biological systems.
Health & Quality of Life	28 **Outdoor space and public realm**	No loss of outdoor space without appropriate mitigation	All dwellings have balconies. Play space for different ages on site, including a small multiple use games area	All dwellings have balconies. Play space for different ages on site, including a half sized multiple use games area All demographics catered for Outdoor space is interactive Allotment space provided	A variety of spaces provided for all demographics. Public realm has some adaptable space should needs change in the future. All rooftop space used for amenity.	
	29 **Security**	Homes are fully secure. Security issues taken into account while designing external spaces, gardens and public realms, lighting, entrances etc.	Security consultant (ALO) consulted Active frontages integral to design	Site made secure through community involvement and passive surveillance rather than CCTV and high security approach. Play spaces overlooked No underground car parks No bedrooms on ground floor	Development has positive effect on security of the wider area,	
	30 **Community Space**	Existing community space replaced	Replacement community space larger than existing. Mainly intended for Council tenant use	Replacement community space provided for all council tenants. Links to children's centre improved. Community facilities and other amenities provided early on in the development to encourage early community development. New amenities provided on site if not available nearby such as cash point, post box	In addition to Innovative Green concierge provides renting service for tools/infrequently used items. New large scale (group) and small scale work spaces provided for residents RHI & FIT funds from renewables to be ring fenced for a community fund to be made available for residents	
	31 **Community Cohesion**	Community bulletin board	Provision on-site for existing community groups and classes	Sustainability related community classes and programmes - facilitate community initiated groups and activities	Green concierge tailoring different classes and interventions to the diverse populations in Agar Grove	
	32 **Employment**		Home office credit achieved	Computer skills, first aid and other employment-related community classes offered on site as a component of the community classes programme.	Existing residents encouraged and supported to set up businesses in new commercial spaces. Apprenticeships offered during the construction period	

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8.0 WATER, OTHER RESOURCES AND SUSTAINABLE CONSTRUCTION

8.1 Water

Currently, during dry weather, London's water consumption outstrips available supply. The city's water resources should be used as efficiently and sustainably as possible. The water strategy on site has been designed to minimise water consumption and achieve 105 litres/person/day Details of the specification for internal water fittings are given in section 5.0; these are in line with legislative requirements from the following documents:

- The London Plan 2011 – Minimising water use and maximising rainwater recycling where possible.
- London Plan Sustainable Design & Construction SPG 2006 - Residential water usage of less than 40m^3 per bedspace per year (approx. 110 litres/head/day)
- The Code for Sustainable Homes (CfSH) Level 4 – Water usage of no greater than 105 litres/person/day.

This requires all fittings to be of a "lower water use" than normal fittings.

The rainwater strategy includes water butts for private gardens and central rainwater tanks with hand pumps for irrigating the communal gardens with the aim of achieving Wat 2 credits and reduce the amount of mains potable water used for external irrigation.

The landscaping strategy also includes the provision of SUDS to the Mayor's preferred standard through green roofs, permeable paving and rain gardens

8.2 Materials and sustainable construction

Building and construction activities worldwide consume 3 billion tonnes of raw materials each year, equalling 40% of total global resources; 10% of virgin construction materials from every building project go straight to landfill.

Reclaiming construction materials and reusing them in a manner that preserves the embodied energy and carbon already invested in the material is therefore environmentally the most advantageous.

For the Agar Grove Regeneration project, the palette of materials has been chosen for longevity, robustness and low maintenance.

The aspiration for Passivhaus means a higher embodied energy than a typical building because of the additional insulation required and additional glazing in the triple glazed window. Wherever possible preference will be given to environmentally low impact materials: Cement replacements will be specified in order to reduce the impact of concrete elements; the insulation used will not contain substances known to contribute to ozone depletion or have the potential to contribute to global warming. Cross laminated timber is also being considered.

Lulworth House
The embodied energy of a building can represent a significant proportion of the lifetime energy of a building.

Reuse of materials is not significantly taken into account by BREEAM and Code which assume all projects are new builds. Early resident consultation led to a desire for full scale refreshment of the site. The strong desire to knit the site back into the community, much improve the townscape, and provide larger, better insulated, and more suitable homes for residents could only be achieved through replacement of the low rise blocks. However the decision to refurbish Lulworth was in large part due to the embodied energy savings it would provide.

The foundations, core and structure represent a significant proportion of the embodied energy of the building. Significant energy from demolition is also prevented. The embodied energy of typical UK housing is 600-800 kgCO_2/m^2, and the demolition of a building an approximate additional 50 kgCO_2/m^2. This could be equivalent to the operational (regulated[3]) emissions produced over 30-40 years of running a 'typical' new home.

8.3 Pollution

There has been a concerted effort to minimise the amount of pollution emitted as a result of the development. It is expected that all specified insulants will have a global warming potential of less than 5. Also, boilers with NOx emissions of less than 40mg/KWh will be specified in order to achieve the full amount of Code credits in the pollution section.

8.4 Waste Storage

The waste strategy for the development is based on the existing local authority collection scheme for recycling waste in the borough of Camden, which offers a weekly post-sorting collection service. Therefore, each dwelling will have a single internal storage bin for recyclable waste with a minimum capacity of 30 litres. This will be located in a dedicated internal space. External bin stores have been carefully sized and located around the site for accessibility ease of recycling. The borough of Camden also offers a weekly food waste collection service, which will be available to the development.

8.5 Low energy travel

The site is well connected by public transport, close to Camden Town and Camden Road stations, and on the edge of the London cycle hire scheme. It is proposed that cycle parking be provided in accordance with London Plan Standards, Early Minor Alterations from 2013. Therefore one space will be provided for each of the 412 units which are one to two bedroomed

[3] Regulated emissions relate to energy loads from running the building, e.g. heating, lighting, pumps

in size, two spaces will be provided for each of the 81 units which are three bedrooms or greater in size and a total of 13 spaces will be provided for visitors to the development. Cycle parking for visitors and community and commercial space will also be provided. Car parking is limited to re-provision of existing spaces.

8.6 Flexibility

The proposals incorporate accommodation for various tenures across the site, with dwellings built to principles of Lifetimes Homes; designing in flexibility should their situation change over time.

The community space provided in Block B has been designed to allow it to be used in a number of ways, for business startups or community groups. A variety of spaces are provided including large spaces with movable partitions.

8.7 Healthy internal environments

The Passivhaus standard requires the use of mechanical ventilation with heat recovery (MVHR). Studies have shown that internal air quality is improved through the use of well-designed and commissioned MVHR systems, and can improve respiratory illnesses.

The triple glazed windows used will be highly acoustically insulating and will reduce the impact of rail and road noise on residents.

8.8 Landscaping and Biodiversity

The development seeks to maximise opportunities for outdoor space-creating a range of high quality public spaces and private spaces and gardens.

Robustness and maintainability reviews have been considered to ensure a quality landscape for future generations. Native plants will be selected that are suited to their intended location and planting method, and rainwater will be used for irrigation so as to relieve pressures on water resources.

As the site is existing, there will no loss of biodiversity or access to nature caused by the development. In fact, the proposals seek to improve the ecological value of the site through the provision of habitat rich and native planting proposals.

Where possible existing mature tree have been retained and many new trees are planned including fruiting species. MKA Ecology have defined the existing estate as being of low or insignificant ecological value, and they have made recommendations for the enhancement of site ecology. The types of measures which will be included in the development as a result are: clearance of vegetation outside of nesting season, native landscape planting and the installation of bird and bat boxes across the site. A minor enhancement in the value of site ecology will be achieved post-development as result of the ecologist's advice. The native planting will be included within communal areas, private gardens and roof terraces, resulting in the creation of a valuable habitat. All outdoor lighting will be designed to be energy efficient with minimum light lost to sky.

8.9 Roof strategy

The roofs have been treated as a resource throughout the project, with a careful balance struck between servicing, energy generation, biodiversity and amenity space, illustrated in figure 10b.

66% of the total site roof is being utilised for energy generation.

8.10 Summertime comfort and climate change adaptation

It is becoming universally recognised that anthropological climate change is shifting Britain's climate towards hotter summer's with higher probabilities of extended summertime heat waves. The design team was aware from an early stage that provisions must be taken to mitigate the risk of overheating; to create thermally comfortable spaces that will continue to operate successfully in future climates. The fact that much of the development hopes to be Passivhaus certified reinforces the requirement for acute attention to detail with respect to overheating, as Passivhaus relies on a highly insulated thermal envelope resulting in the bare minimum heat loss. In the winter, this allows the dwelling to take advantage of Solar Gains for free heating, but in the summer affective strategies to control gain and flush away heat must be considered. The dwellings will be naturally ventilated through external openings in summer without active cooling (complying with The Camden Plan).

Most of the dwellings are dual aspect and allow for an amount of cross-ventilation. This is the most effective means of limiting overheating under future climate conditions. Agar Grove is a large and diverse development, in the design stage worst case scenarios with respect overheating have been targeted and design strategies have been developed to ensure that the flats in these locations have suitable provisions to avoid summertime overheating. Flats considered in most detail are the single aspect South facing flats in Lulworth House and Plot's A and B. These flats have glazed South facing facades (i.e. the highest solar gain) and are less able to achieve large ventilation rates (as they are single aspect and cannot cross-ventilate). Further details can be found in Appendix A12.

8.11 Response to mitigating the Urban Heat Island effect

Camden sits near the centre of London's urban heat island. The increase in density on the site could increase the contribution to the urban heat island. The effect will be mitigated by the addition of a considerable number of new trees.
The use of green roofs and photovoltaics which both store less solar energy than massive building materials, and the former providing some cooling through transpiration. Ground level greenery including rain gardens will also provide cooling. For more details of the landscaping refer to the landscaping report.

Figure 10a - London's urban heat island

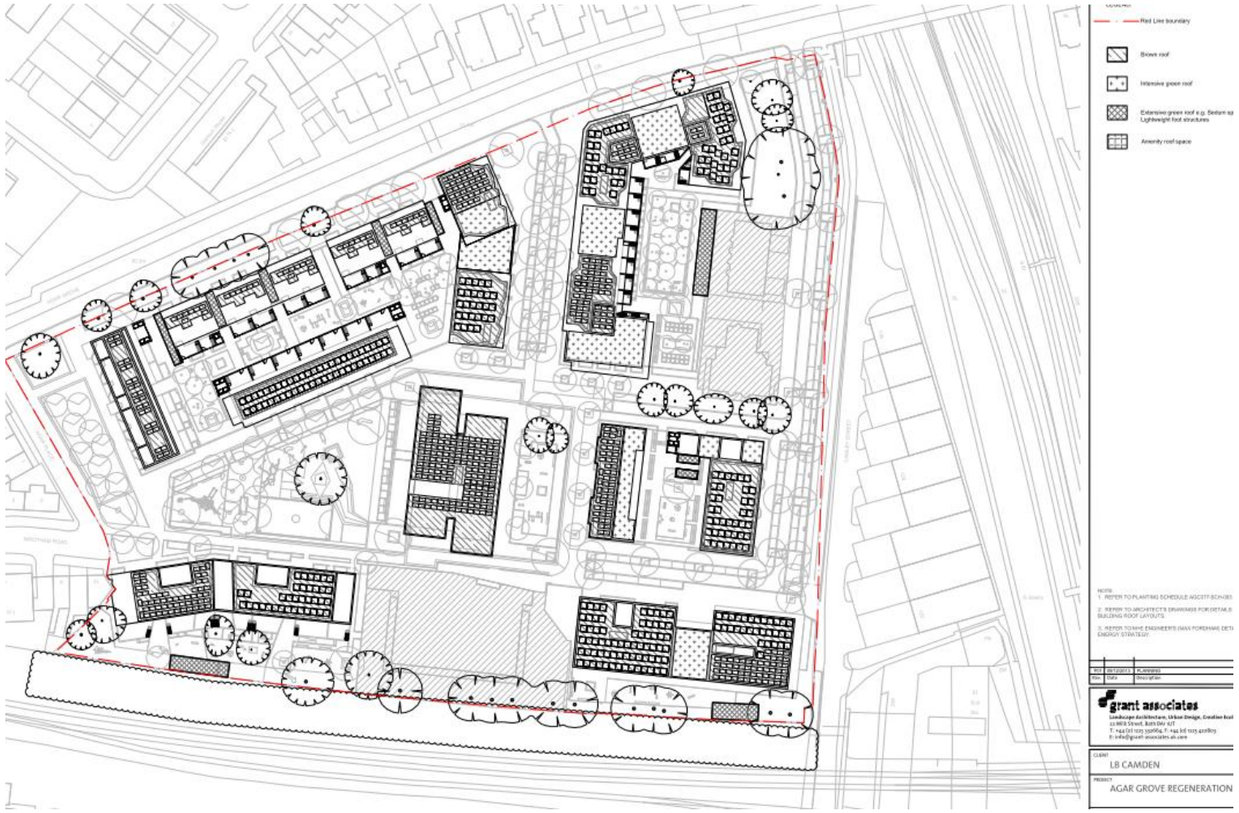

Figure 10b – Roof usages diagram.

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9.0 CONCLUSION

This development is the largest community investment programme currently being undertaken in Camden and as such is intended to be an exemplar in a number of ways and go beyond the baseline planning requirements.

The development energy strategy is 'Be lean' in its approach; The design team are aiming to achieve Passivhaus Standard on all of the new plots and are aiming for CfSh level 4 on the refurbished Lulworth. If successful Agar Grove would be the largest Passivhaus scheme in the UK. Carbon emissions will be reduced primarily by implementing 'passive' energy efficiency measures to reduce the demand for energy rather than meet a larger demand with renewable sources.

The Be Lean fabric and services measures reduce the regulated carbon from around 396 to 344 tCO_2/yr. No improvement is proposed at present via the be Clean step: CHP, as CHP is not required for this site by the GLA. Finally the rooftop PV and solar thermal arrays reduce the CO_2 to approximately 268 tCO_2/yr, or an overall reduction of 32%.

Providing better homes and community regeneration and social sustainability is at the heart of this project. Unlike energy these are difficult to measure and communicate. The sustainability matrix aims to achieve this through setting a number of targets covering a wide range of sustainability criteria from energy and water to materials, waste, management and biodiversity, and health and quality of life.

An initial matrix of issues specific to the Agar Grove Regeneration has been presented. We have highlighted the target ranges for the project; the majority are in the innovative level with some moving into Pioneering. These apply primarily to new build housing and the overall masterplan.

The design team are aiming to achieve Passivhaus Standard on all of the new plots, and Code for Sustainable Homes Level 4, and are aiming for BREEAM Domestic Refurbishment 'Excellent' on the refurbished Lulworth.

Some specific targets include investigating the use of a green concierge onsite to help residents make best use of their new homes, including reading and understanding their smart meters to reduce unregulated energy use, and help with encouraging allotment use. Camden would also like to investigate using renewable heat incentive and feed-in-tariff revenues to provide a community investment fund.

APPENDIX A1 SITE PLAN

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Project	Agar Grove Estate Regeneration
Drawing	Masterplan Roof Plan
Scale	1:500@ A1
Date	October 2013
Drawn by	Various
Checked by	SR
Job Number	HB1423
Status	Draft
Drawing No. & Revision	1423_DWG_00_120

DRAFT

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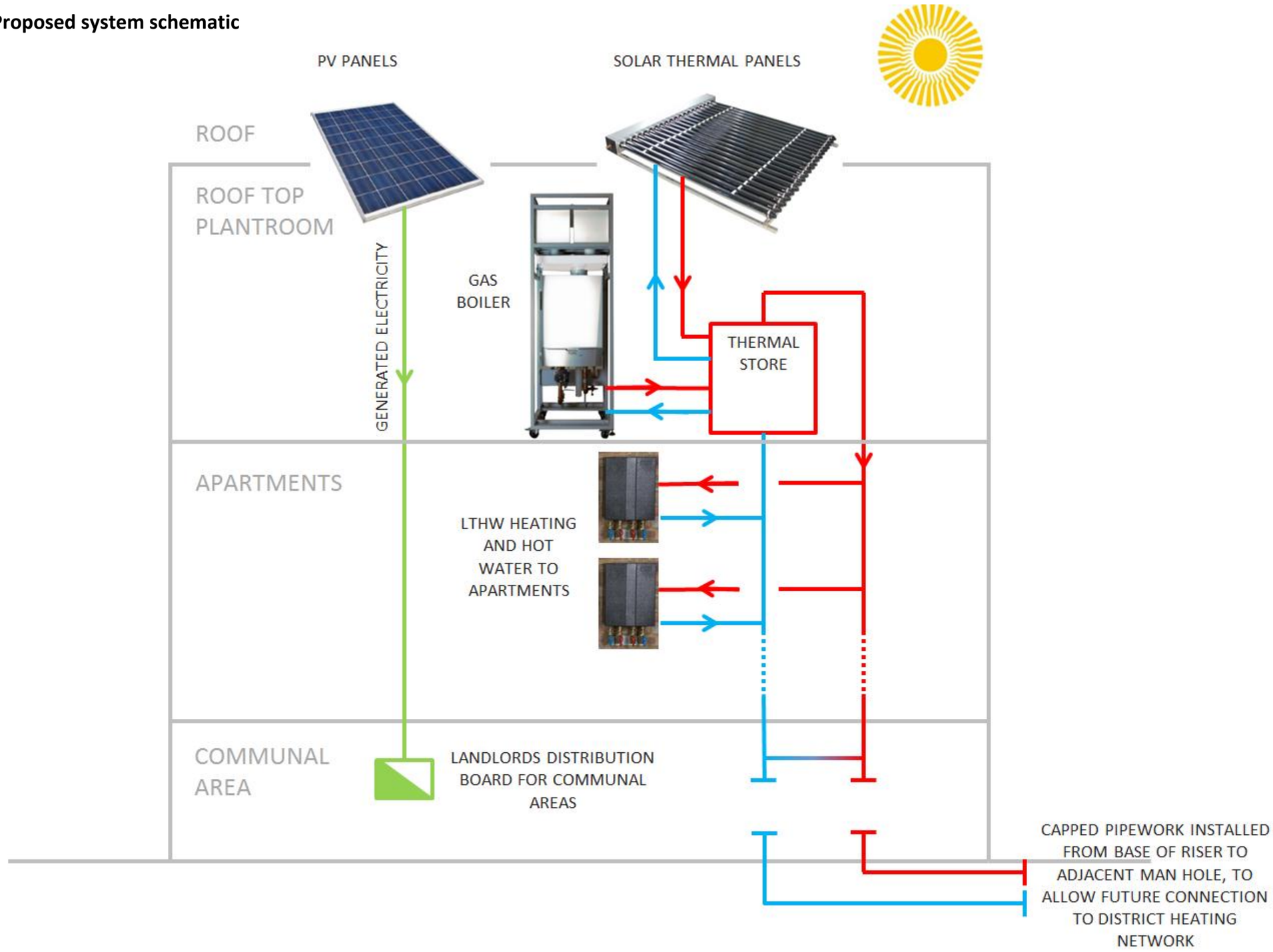
APPENDIX A2 SCHEMATIC OF PROPOSED SYSTEM AND PROPOSED ROOF PLANS

9.1 Proposed system schematic



9.2 Proposed roof plan for renewables and rooftop plantrooms and reserved routes for future connection to district heating

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APPENDIX A3 DESCRIPTION OF PROPOSED ADVANCED HEAT DISTRIBUTION

Appraisal of district heating losses
The Standard assessment procedure "SAP 2009" is the calculation used to compare new build homes for carbon emissions. When we examined in depth, it was found to not accurately model the true heat loss and electricity use of a district heating system.

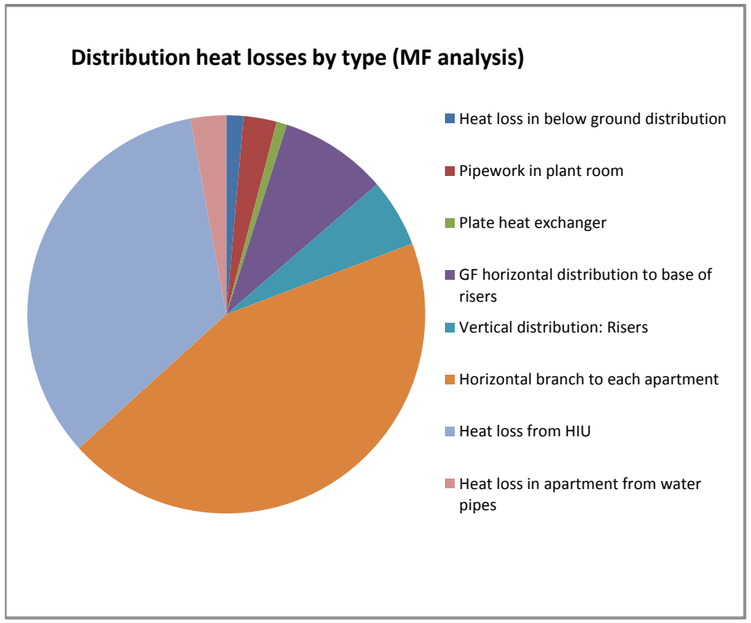
SAP applies a flat rate for heat loss (5%) and for electricity use (~30kWh/yr) with no regard for the geometry or specification of the distribution system. Using sensible values for a good quality installation we have calculated the actual heat loss to be around 50% of the total generated heat:

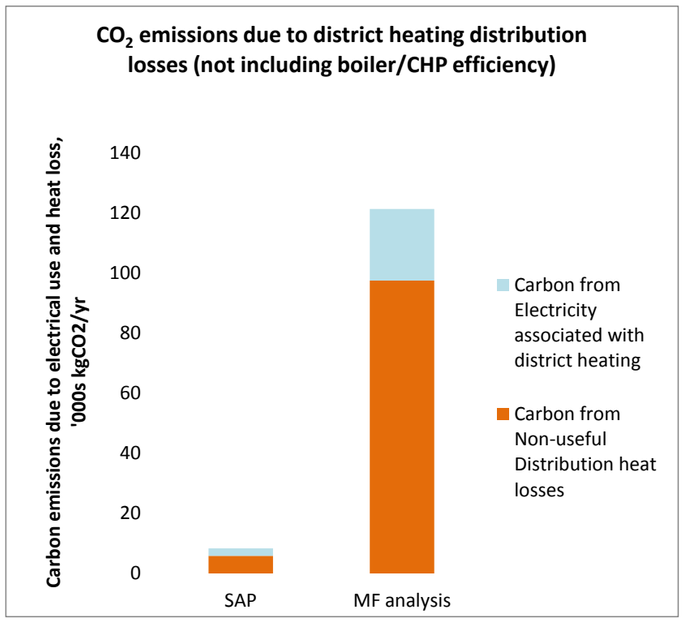
Figure A3.1 shows that SAP underestimates the carbon emissions due to heat loss and electricity use of district heating systems; in this example by a factor of 4. The pie chart below shows the main sources of loss are the branch connections to each flat and the HIUs themselves.

The 50% heat loss has been confirmed by many London housing associations experience- they have measured data showing a 70% loss in the risers alone.

A particular set of data we have seen has measured data showing a DH heat distribution efficiency of 49 % in winter and 21% in Summer. We believe that we can improve on this somewhat with expensive considered system design, but it demonstrates the inaccuracy of SAP's assumption.

This is also backed up by measured data from a large sample from Denmark, where district heating is more prevalent than in the UK. We can expect the systems there to be well designed and commissioned.





Left: Figure A3.2 - A break-down of the heat losses as calculated by MF analysis

Right: Figure A3.1 - Carbon emissions due to heat loss and electricity use- a comparison of SAP calculation assumptions and MF (Maxfordham LLP) analysis findings.

The graph demonstrates the following key principle: For a given district heat system, the heat losses are fixed. If this system is connected to improved efficiency houses, the losses become a greater proportion of the total heat demand. In short, district heating can encourage the building of inefficient houses! This measured data confirms our calculated model that we can expect 50-60% heat losses for a modern well insulated house connected to DH. 50-60% phrased another way is 40-50% efficient.

From this analysis we can draw the following comparison:

	SAP 2009 Default values	MF Analysis	Housing association measured data	Danish survey measured data		
Heat distribution efficiency for new blocks	95%	49%	35%	40-50%		
Electricity demand per apartment for district heating circulation.	30 kWh/yr			290 kWh/yr	-	-

Figure A3.3 - Comparison of SAP default values with MF calculated values, and measured values from two sources.

This goes some way to explaining the performance gap in modern district heated homes – SAP is highly influential in funding decisions, SAP prioritises renewables over lean district heating design – with the result that money is invested in the former to the detriment of the latter. But it doesn't have to be this way.

At Agar Grove we have been advising on means to reduce these losses to a minimum (yet economic) level. Camden is ready to commit to investing significantly into this advanced specification. Below we summarise some key features.

In a district heated (DH) scheme, the heat is distributed to heat interface units (HIUs) in each flat. These contain one or two heat exchangers, plus metering, a pump and controls.

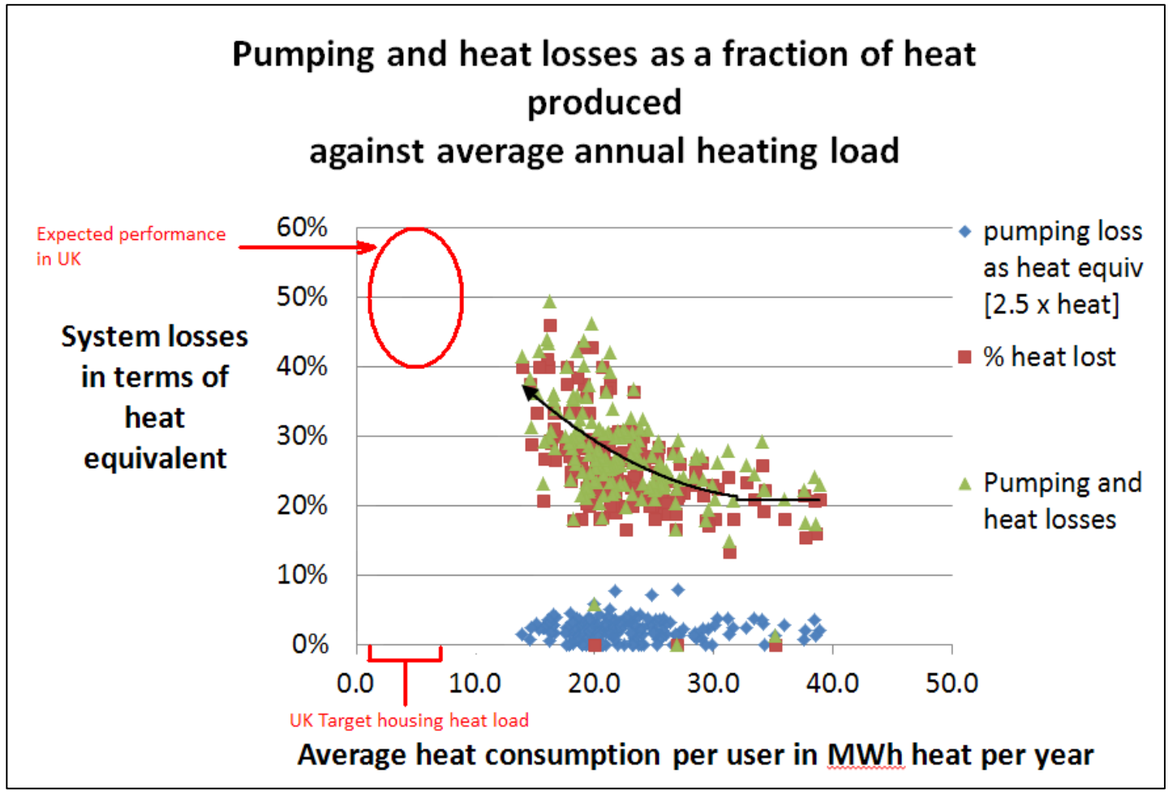


Figure A3.4 - Heat losses from district heating in Denmark: measured data. Source: Danish District heating Association

Figure A3.5 – Left: inefficient HIUs. Right: efficient HIUs which will be specified on Agar Grove.

A basic specification HIU commonly found on private developments have un-insulated pipework, radiating metal casings, in-direct heating, un-insulated expansion vessels, and circulation pumps. Often they include storage tanks too. These are illustrated on the left above.

The HIUs at Agar Grove are more expensive to buy and more efficient to run. They have minimised pipework the HIU is fully insulated, we may directly connect the HIU to reduce losses, and the LTHW temperatures will be reduced to a minimum while remaining legionella-safe. These are illustrated on the right.

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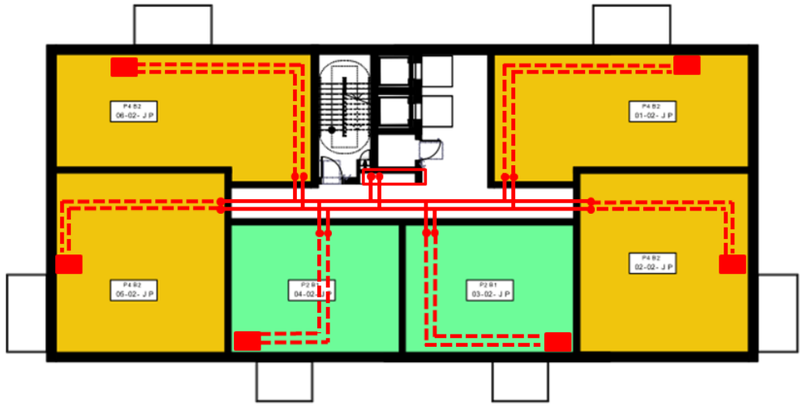
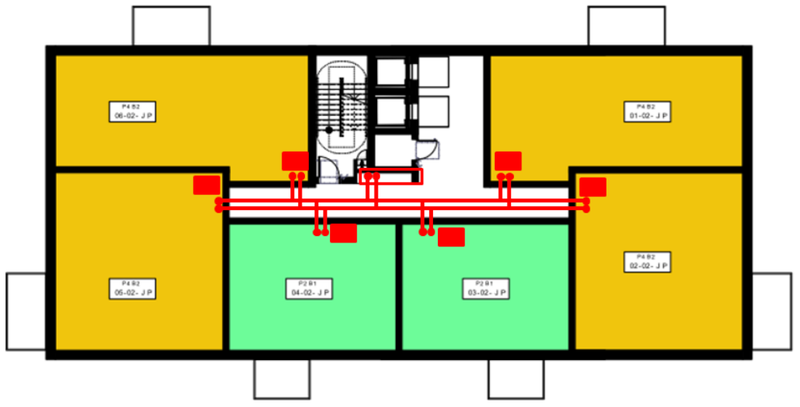
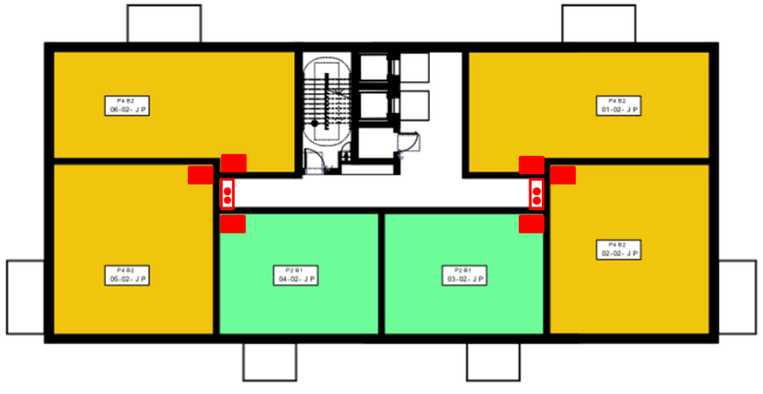
Pipe layout; a traditional DH distribution, has a single riser, laterals above ceiling, HIU in kitchens (combi-boiler position) (see below).



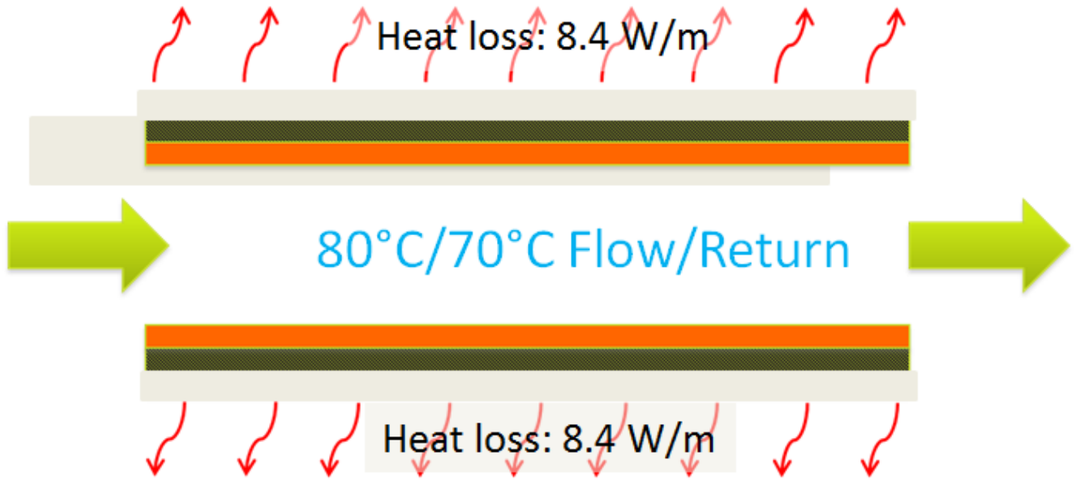
The laterals can be reduced by minimising the laterals in flat (see below)



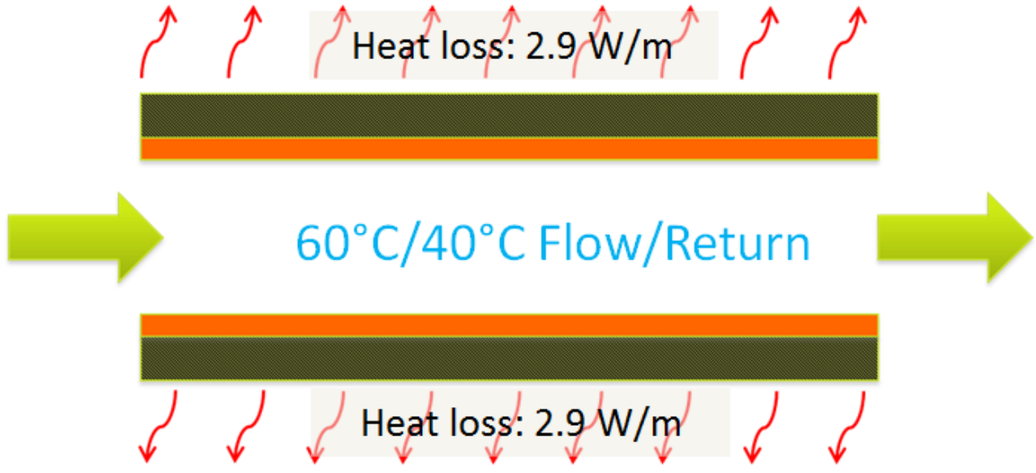
The losses can be reduced still further by having a twin riser and minimum laterals in the flat.



The temperature of the flow, and insulation applied to the pipes also significantly affects the heat loss. This arrangement has 8.4W/m.



However this more expensive design with lower flow temperature and more insulation more than halves the losses:



Insulation applied only to straight, clear sections of pipe is only half the story. In reality any DH distribution network has scores of bends, joints, supports, valves and appliances.

If left un-insulated the heat loss from these accessories can account for more than half of the total heat loss. Our specification will ensure that each of these are individually wrapped and insulated , much like a chilled water installation

Camden is intending to invest in these features to reduce the losses to around 28% of the total annual heat delivered. Note how this has been reduced from 60% for a more typical private development. Note that neither the cost of capital investment, nor the savings in running cost and Carbon are recognised by the SAP calculation.

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APPENDIX A4 CODE FOR SUSTAINABLE HOMES PRE-ASSESSMENT REPORT

9.3 Introduction

The sustainability assessments for Agar Grove Estate Redevelopment have been split between two methodologies. Code for sustainable homes for each of the new build dwellings and BREEAM Domestic Refurbishment for the flats in Lulworth. This report outlines the specific requirements for the new build housing.

9.4 Building Research Establishment Environmental Assessment Method

The Code for Sustainable Homes (the Code) is an environmental assessment methodology for rating and certifying the performance of new homes. It is managed by BRE Global under licence from the Department for Communities and Local Government. The environmental performance is assessed in a two-stage process (design stage and post construction stage) using objective criteria and verification.

9.5 Scoring and Rating

The assessment covers nine categories of sustainable design and is undertaken on a dwelling by dwelling case. To qualify for certification minimum standards must be met in 5 categories (Energy; Water; Environmental Impact of Materials; Management of Surface Water Run-off and Storage of Waste & Recycling). A weighting system is used to determine the relative value of each category and its contribution to the overall Code score. Table 1 summarises the number of credits in each section and the relative weighting of the credits as a percentage of the assessment as a whole:

BREEAM SECTION	NO. CREDITS AVAILABLE	% WEIGHTING	VALUE OF EA CREDIT (%)
Energy	31	36.4	1.17
Water	6	9.0	1.50
Materials	24	7.2	0.30
Surface Water Run-off	4	2.2	0.55
Waste	8	6.4	0.80
Pollution	4	2.8	0.70
Health & Well-being	12	14.0	1.17
Management	9	10.0	1.11
Ecology	9	12.0	1.33
TOTAL	**107**	**100**	

Table A4.1 – Section scores and weighting

9.6 Code for Sustainable Homes Ratings

The number of credits achieved in each section is totalled to give a percentage score. An overall rating of the building's performance is given from level 1 to level 6. This is determined from the total amount of Code criteria met and their respective environmental weightings. The minimum score for each level can be seen in the table below.

CODE RATING	% SCORE
Level 1 ★	36
Level 2 ★★	48
Level 3 ★★★	57
Level 4 ★★★★	68
Level 5 ★★★★★	84
Level 6 ★★★★★★	90

Table A4.2 – Code score thresholds

Setting a target rating
When setting a target rating it is advisable to target a score 5% greater than needed so that if credits are lost at a later stage code level 4 can still be achieved. In particular materials credits and construction dependent credits are high risk and can easily be lost.

9.7 Camden Policy

Camden's Policy DP22 Promoting sustainable design and construction and the London Plan expect new build housing to meet Code Level 4 by 2013. In addition Camden's Policy DP22 requires the following minimum standards to be met.

Minimum Standard for Categories (% of un-weighted credits)
• Energy 50%
• Water 50%
• Material 50%

Table A4.3 – Camden policy minimum scores for sections

The maximum water use target required for a particular level can be achieved by fitting water saving sanitary ware, such as dual volume flush toilets and low flow taps.

9.8 Mandatory Requirements (Level 4)

Energy
Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER) using SAP, measured with the Part L1A 2010 TER as the baseline.

Where a building contains multiple dwellings, Ene 1 will be calculated based on the average energy performance of all dwellings within the building. However, this cannot be extended to different apartment blocks. It is essential that *each block* achieve the minimum improvement in CO_2 emissions to enable the required Code Level to be achieved.

Code Level	Minimum Percentage Improvement in DER over 2010 TER
Level 1	0% (Compliance with Part L 2010 only is required)
Level 2	0% (Compliance with Part L 2010 only is required)
Level 3	0% (Compliance with Part L 2010 only is required)
Level 4	25%
Level 5	100%
Level 6	Net Zero CO2 Emissions

Table A4.4 – Minimum energy levels

Water
Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply, as seen in the table below.

No. Credits	Water Usage	Mandatory for Level
1	≤ 120 l/p/day	Levels 1 & 2
2	≤ 110 l/p/day	
3	≤ 105 l/p/day	Levels 3 & 4
4	≤ 90 l/p/day	
5	≤ 80 l/p/day	Levels 5 & 6

Table A4.5 – Minimum wat

To gain a higher score under Wat 1 it would be necessary to install rainwater harvesting, grey water recycling or ultra-low water use fittings

A suggested set of maximum flow rates/capacities that would satisfy the daily usage requirement of < 105l/p/day for Code Level 4 can be seen in the following table.

Fitting	Flow Rate / Capacity
Dual flush WC	4 litre / 2.6 litre
Wash hand basin taps	max 4 litre / min
Shower	max 9 litre / min
Bath	max 170 litre capacity
Kitchen taps	max 8 litre / min
Dishwasher	4.5 litre / person / day (default value if no dishwasher)
Washing machine	17.16 litre / person / day (default value if no washing machine)

Table A4.6 - Proposed maximum water efficient fittings specification to meet 105 l/p/day

Surface Water Management
The development ensures that the peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site, a mandatory requirement.

The additional predicted volume of rain water discharge caused by the new development must be entirely reduced as far as possible, in accordance with the assessment criteria. In addition, the drainage system must be designed to be able to cope with local drainage system failure.

Waste
The development must have accessible general waste storage facilities in line with local authority requirements as a mandatory requirement. The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906.

Environmental impact of materials
At least three of the five main building elements (roof, external walls, internal walls, floors, windows) must be rated at least D in the Green Guide to Specification as a mandatory requirement. The Green Guide to specification should be consulted to ensure the specification of high rated materials for the key building elements.

9.9 Additional Code Issues targeted on Agar Grove and expected score

Non-mandatory, tradable credits have been selected for the Agar Grove development **worst case** scenario and are listed below in table opposite. The achievement of these credits would produce a Code score of **72.25%,** a Level 4 (where a minimum of 68% is required). This produces a 4.25% margin in targeting a Level 4.

Code Credit Issue	Credits Targeted	% of Total Score
Ene 2 - Fabric Energy Efficiency	9/9	10.57%
Ene 3 – Energy Display Devices	2/2	2.35%
Ene 4 - Drying Space	1/1	1.77%
Ene 5 - Energy Labelled White Goods	1/2	1.77%
Ene 6 - External Lighting	2/2	2.35%
Ene 7 - LZC technologies	1/2	1.77%
Ene 8 - Cycle Storage	1/2	1.17%
Wat 2 - External Water Use	1/1	1.5%
Mat 1 - Environmental Impact of Materials	5/15	1.5%
Mat 2 - Responsible Sourcing - Basic Elements	3/6	0.9%
Mat 3 - Responsible Sourcing - Finishing Elements	1/3	0.3%
Sur 1 - Reduction of Surface Water Run-off: Tradable credits	2/2	1.1%
Sur 2 - Flood Risk	1/2	0.55%
Was 1 - Waste Storage & Recycling Facilities: Tradable credits	4/4	3.2%
Was 2 - Construction Site Waste Management	3/3	2.4%
Was 3 - Composting	1/1	0.8%
Pol 1 - GWP of Insulants	1/1	0.7%
Pol 2 - NOx Emissions	3/3	2.1%
Hea 2 - Sound Insulation	3/4	3.5%
Hea 3 - Private Space	1/1	1.17
Hea 4 - Lifetime Homes	4/4	4.67%
Man 1 - Home User Guide	3/3	3.33%
Man 2 - Considerate Constructors Scheme	2/2	2.22%
Man 3 - Construction Site Impacts	2/2	2.22%
Man 4 - Security	2/2	2.22%
Eco 1 - Ecological Value of Site	1/1	1.33%
Eco 2 - Ecological Enhancement	1/1	1.33%
Eco 4 - Change of Ecological Value of Site	3/4	4.0%
Eco 5 - Building Footprint	2/2	2.67%

Table A4.7 - Code pre-assessment scores

9.10 Meeting Camden Policy

The borough of Camden sets a minimum standard of achieving at least 50% of the credits in the energy section. An effort has been made to significantly exceed this through a number of strategies, but in the most part it comes down to an efficiency first policy. This is illustrated by the fact that a maximum score in fabric energy efficiency is expected in the dwellings due to allowing the Passivhaus standard. This will have a big impact on reducing overall carbon emissions as well as the end users' energy bills. Further credits are gained in the energy section for a variety of issues, for example: Low and zero carbon technologies, cycle storage and heated and extracted internal drying cupboards. Issues such as cycle storage and drying space have been targeted not only for their impact on energy, but also air quality and quality of life they will bring to the occupiers. To use drying cupboards as an example, surveys show residents indicate a desire to have a dedicated space for drying clothes which can be used all year round, rather than a communal or outdoor space.

As stated in section 1.2, Camden has minimum requirements for standard categories as a % of un-weighted credits. The worst case scenario presented achieves the following:

Categories	Camden requirements	Agar worst case
Energy	50%	64.5%
Water	50%	67%
Materials	50%	38%

Table A4.8 - Camden Minimum Code Category Requirements

The development is expected to surpass the minimum requirement set by Camden policy for Energy and Water sections. However it is expected to fall short of meeting Camden's requirements in the materials section. Before the final design is set it is not possible to know the exact score, however efforts have been made to check this as the project progressed.

One of the reasons for achieving a low score in the materials section is the use of triple glazed windows. Triple glazed windows are being specified due to the pursuit of Passivhaus standards and contribute to the better than average score in the energy section. In this respect, a slightly below par score on materials is understandable; work is being done to improve this score by looking into alternative materials which would still satisfy the design

9.11 Enhancing Site Ecology

A wide range of measures are being incorporated into the design and therefore implemented on site based on recommendations from the ecologist. The overall aim is to protect ecological features and substantially enhance site ecology.

In an effort to protect wild birds, their nests and their eggs, vegetation clearance works will aim to be undertaken outside of nesting season. Where this is not feasible, a nesting bird check will be undertaken by an experienced ornithologist prior to the commencement of any vegetation clearance.

In order to enhance the value of the site for breeding birds and bats, a large number of bird and bat boxes will be installed on suitable trees or structures across the site. To improve overall biodiversity, native British plant species are being incorporated into the landscaping plans along with nectar rich

flowing shrubs and herbaceous mixes. The combination of woodland edge boundary planting, climbing perimeter planting, species rich turf lawns and rain gardens will all help contribute to the overall ecological enhancement of the site. Furthermore, in an effort to increase the area available for planting, green and brown roofs will be included on suitable flat-roofed buildings. Green roofs are likely to be planted as an acidic grass land habitat or with a sedum mix and brown roofs will add considerable invertebrate diversity.

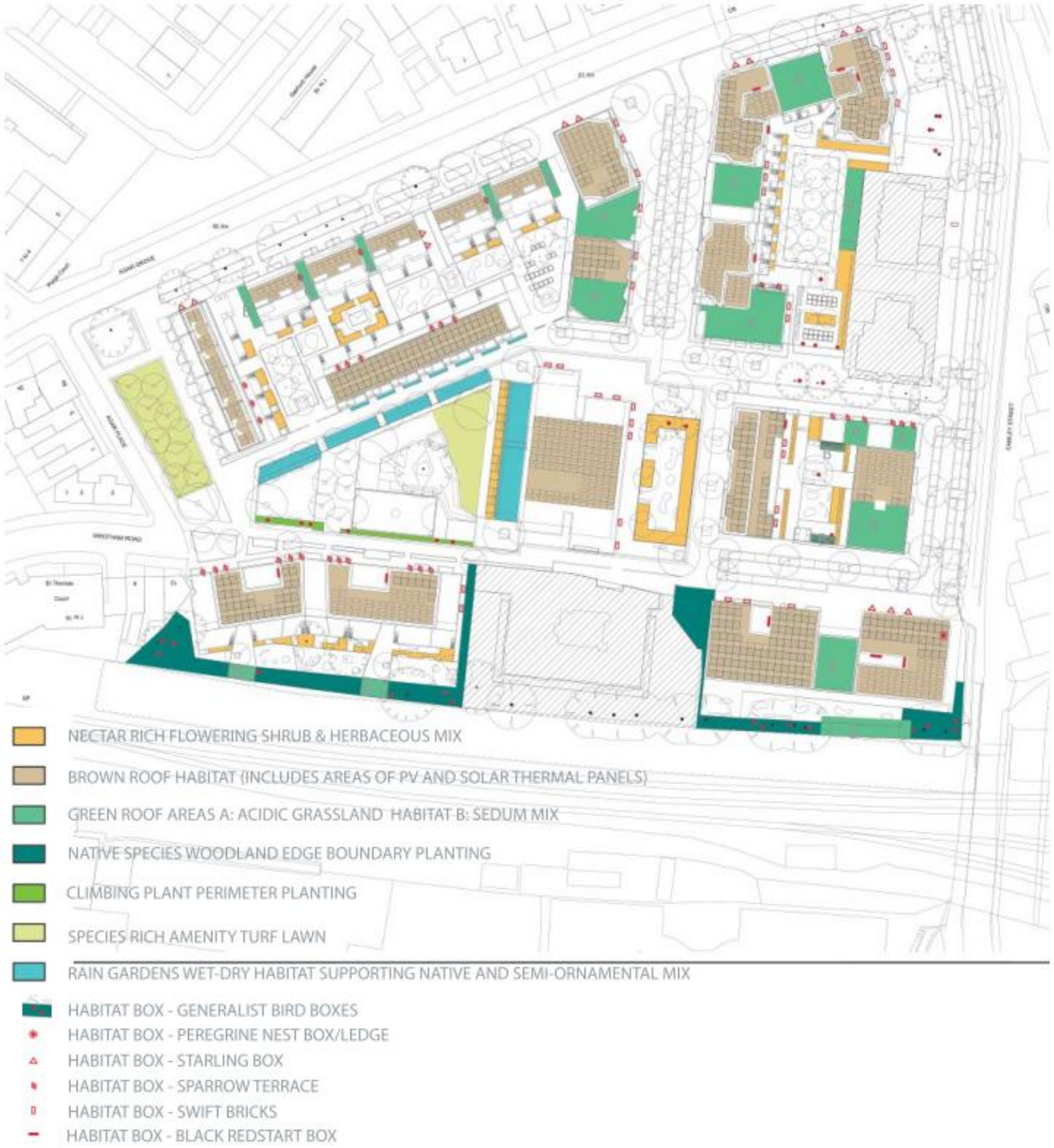

Figure A4.1 Habitat and Biodiversity strategy by Grant Associates

Code for Sustainable Homes - Score Summary
Agar Grove - Pre-Assessment
Score Summary
Issue: 15/11/2013

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Mandatory element for Code Level 4

		Credit Value (%)	Available Credits		Level 4		
				Score (%)	Credits	Score	
Energy	**Criteria**	**1.17**	**31**	**36.40**	**20.00**	**23.48**	**Comments**
Ene 1	**Dwelling Emission Rate** (Mandatory requirements) Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER), measured using the AD L1A 2010 TER as the baseline. Minimum standards for each Code level apply. the Code calculator can be used to calculate the predicted score.	1.17	10	11.74	3	3.52	For Code Level 4, it is mandatory to achieve at least a 25% improvement of DER (dwelling emission rate) over TER (target emission rate)(2010). This equates to 3 out of the 9 available credits. Detailed SAP claculations to confirm this. There is an option to target an extra credit in Ene 1 with additional PV.
Ene 2	**Fabric Energy Efficiency** Credits are awarded based on the Fabric Energy Efficiency (kWh/m²/yr) of the dwelling. Minimum standards apply at Code levels 5 and 6. The Code energy calculator can be used to calculate a predicted score.	1.17	9	10.57	9	10.57	A score of 9 out of 9 credits is achievable based on the fact that Passivhaus standard is being targeted. This is being confirmed by SAP calculations for each unit type.
Ene 3	**Energy Display Devices** Credits are awarded where a correctly specified Energy Display Device is installed monitoring electricity and/or primary heating fuel consumption. 1 credit fro primary heating OR electricity only 2 credits for both	1.17	2	2.35	2	2.35	An Energy Display Device which monitors the use of both electricity and primary heating fuel to be provided to each dwelling.
Ene 4	**Drying Space** One credit is awarded for the provision of either internal or external secure drying space with posts and footings or fixings capable of holding 4m+ of drying line for 1-2 bed dwellings and 6m+ for dwellings with 3 bedrooms or greater.	1.17	1	1.17	1	1.17	To meet code requirments for 1 credit, heated and extracted internal drying cupboards to be specified to dwellings.
Ene 5	**Energy Labelled White Goods** Credits are awarded where each dwelling is provided with either information about the EU Energy Labelling Scheme, White Goods with ratings ranging from A+ to B or a combination of the previous according to the technical guide. 1 credit for EU labelling information only OR 1 credit for A+ rated fridge and freezers OR 2 credits for A+ rated fridge and freezers AND A rated washing machines and dishwashers AND either B rated tumble dryer/washer dryer or EU labelling information in place of tumble dryer/washer dryer.	1.17	2	2.35	1	1.17	1 credit will be gained, where no white goods are provided, through the provision of an EU Energy Efficiency Labelling Scheme Information to each dwelling. Private dwellings will gain a 2 credits from the provision of compliant white goods.
Ene 6	**External Lighting** Credits are awarded based on the provision of space lighting* with energy efficient light bulbs (1 credit) and security lighting fittings with energy efficient light bulbs and with appropriate control gear (1 credit). i.e. Max 150 W, PIR and daylight cut-off sensors for burglar security lights. Daylight cut-off sensors OR time switch for all other security lighting. If no security lighting is installed, the security lighting credit can be awarded by default,	1.17	2	2.35	2	2.35	All external lighting provided for the new development, including lighting in common areas, will be provided with energy efficient light bulbs for 1 credit. For the 2nd credit, any security lighting fittings willhave the appropriate control gear, as outlined in the criteria column. Where no security lighting is installed, the security lighting credit can be awarded by default. 2 credits is targeted for the development.
Ene 7	**LZC technologies** Credits are awarded where there is a 10% or 15% reduction in CO_2 emissions resulting from the use of low or zero carbon technologies. 1 credit for 10% reduction 2 credits for 15% reduction	1.17	2	2.35	1	1.17	The reduction in CO2 emissions of at least 10%, as a result of the renewable or low carbon technology will result in 1 out of the 2 available credits being achieved. This is being confirmed following SAP calculations for each unit type.
Ene 8	**Cycle Storage** Credits are awarded where adequate, safe, secure and weather proof cycle storage is provided according to the Code requirements. 1 credit for storage provision in line with the following: Studios/1 bed dwellings – 1 cycle for every two dwellings 2 & 3 bed dwellings – 1 cycle per dwelling 4 bed + – 2 cycles per dwelling 2 credits for complaint storage provision in line with: Studios/1 bed dwellings – 1 cycle per dwelling 2 & 3 bed dwellings – 2 cycles per dwelling 4 bed + – 4 cycles per dwelling	1.17	2	2.35	1	1.17	The cycle provision is currently being led by the planning requirement which sits somewhere between the provision for 1 and 2 code credits.

Ene 9	**Home Office** A credit is awarded for the provision of a home office. The location, space and services provided must meet the Code requirements. Including: Average daylight factor of 1.5%; Adequate ventilation (openable window or alternative ventilation); Two double power sockets; Telephone and Broadband points; and Sufficient space (min 1.8 m wall length).	1.17	1	1.17	0	0.00	It is assumed that daylighting levels will be too difficult to achieve for every dwelling. Home offices must be in an appropriate room with adequate ventilation, 1.5% average daylight factor, 2 double power sockets, 2 telephone points or one telephone point + cable or broadband internet access and a min wall length of 1.8m.
Water		**1.50**	**6**	**9.00**	**4.00**	**6.00**	
Wat 1	**Internal Potable Water Use** (Mandatory requirements) Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply. 1 credit for ≤ 120 l/p/day (Mandatory for Levels 1 & 2) 2 credits for ≤ 110 l/p/day 3 credits for ≤ 105 l/p/day (Mandatory for Levels 3 & 4) 4 credits for ≤ 90 l/p/day 5 credits for ≤ 80 l/p/day (Mandatory for Levels 5 & 6)	1.50	5	7.50	3	4.50	For Code Level 4, a maximum internal water usage of 105 litres/per person/per day is allowed, which equates to 3 credits. This is a mandatory requirement for Level 4. The number of credits awarded are determined using the Code Wat1 calculator tool. Low flow taps and water saving sanitary ware will be specified with sufficiently low water use requirements to achieve these credits. For example, the absolute maximum flow rates/capacities that would satisfy the daily usage requirement of <105l/p/day for Level 4 of the Code for Sustainable Homes are as follows; Dual flush WC (4 litre / 2.6 litre); max 4 litre/min wash hand basin taps; max 9 litre/m shower; max 170 litre capacity bath; max 8 litre/min kitchen taps; dishwasher with 1.25 litre/place setting; washing machine with 104.7 litre/person/day. 1 extra credit may be achievable through the use of extremely water efficient fittings in the social rented units.
Wat 2	**External Water Use** A credit is awarded where a compliant system is specified for collecting rainwater for external irrigation purposes. e.g. rainwater butts and central rainwater collection systems. Applicable to all dwellings with a garden, patio or communal garden space. Where no outdoor space is provided the credit can be achieved by default. Sufficient size: Terraces and patios – 100 litres min; 1–2 bed home with private garden – 150 litres min; 3+ bedroom home with private garden – 200 litres min. For communal gardens: 1 litre/m_2 of land, with a minimum of 200 litres.	1.50	1	1.50	1	1.50	In order to gain this credit, a combination of central rainwater collection and individual water butts will provide the dwellings with water for irrigation. This will be in line with the Code volume and specification requirements (outlined in the criteria column).
Materials		**0.30**	**24**	**7.20**	**9.00**	**2.70**	
Mat 1	**Environmental Impact of Materials** (Mandatory requirements) <u>Mandatory Requirement:</u> At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D. <u>Tradable Credits:</u> Points are awarded on a scale based on the Green Guide Rating of the specifications. The Code Materials Calculator can be used to predict a potential score.	0.30	15	4.50	5	1.50	At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D as a mandatory requirement. 5 out of 15 credits is the current estimate. This is predominantly due to the concrete frame and triple glazed windows. In order to achieve more credits, the Green Guide to specification is being consulted by the design team to seek alternative materials for current elements which score poorly. Points are accrued where key building elements with a high Green Guide rating are specified. This information is entered into the Code Materials calculator and the number of credits are determined.
Mat 2	**Responsible Sourcing - Basic Elements** Credits are awarded where materials used in the basic building elements are responsibly sourced. i.e. Supplier has BES6001 certificate or certified environmental management system (EMS) (e.g. ISO 14001) for key processes and/or supply chain AND/OR Chain of Custody certification for Timber (e.g. FSC, PEFC, SFI). The Code Materials Calculator can be used to predict a potential score.	0.30	6	1.80	3	0.90	These credits are difficult to achieve, involving a long time-consuming paper trail. 3 of the 6 available credits have been agreed. This will require a significant commitment from the team and engagement by the contractor at an early stage, to ensure that an adequate amount of material is responsible sourced. The number of credits are calculated using a Code tool. 80% of the assessed materials must be responsibly sourced (i.e. suppliers covered by EMS e.g. ISO 14001 and/or Chain of Custody e.g. FSC timber) to contribute to the credit score. 100% of any timber must be legally sourced. Further details of how to achieve these credits can be provided by the assessor on request.
Mat 3	**Responsible Sourcing - Finishing Elements** Credits are awarded where materials used in the finishing elements are responsibly sourced. As detailed above. The Code Materials Calculator can be used to predict a potential score.	0.30	3	0.90	1	0.30	As above, these credits are difficult to achieve, involving a long time-consuming paper trail. A conservative effort of 1 of the 3 available credits will be achieved for the development. As above, points are awarded where 80% of the assessed materials within the Finishing Elements are responsibly sourced. 100% of any timber must be legally sourced.
Surface Water Run-off		**0.55**	**4**	**2.20**	**4.00**	**2.20**	
Sur 1	**Reduction of Surface Water run-off from site** (mandatory requirements) <u>Mandatory Requirement:</u> Peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. AND Designing the drainage system to be able to cope with local drainage system failure. <u>Tradable Credits:</u> Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters: 1 credit for: ensuring that there is no discharge from the developed site for rainfall depths up to 5mm. 1 credit for: ensuring that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with The SuDS Manual to minimise the risk of pollution	0.55	2	1.10	2	1.10	For all levels of the Code it is a mandatory requirement that the peak rate of run-off over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. A site-specific Flood Risk Assessment (FRA) is being produced in line with PPS25 Development and Flood Risk. In addition to this, tradable credits will be gained by ensuring there is no discharge from the developed site for rainfall depths up to 5mm and by introducing SUDS to improve the water quality of the rainwater discharged from the development site, in accordance with The SuDS Manual to minimise the risk of pollution (as per details within the Criteria column). PBA are currently working on the strategy to achieve the mandatory criteria and both credits.

Sur 2	**Flood Risk** Credits are awarded where developments are located in areas of low flood risk (2 credits available) or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide (1 credit available). A site-specific Flood Risk Assessment must be produced (prepared according to good practice guidance as outlined in PPS25 Development and Flood Risk), which shows the risk of flooding from **all sources.**	0.55	2	1.10	2	1.10	PBA confirm the site is in Flood Zone 1 'low probability' and that a Flood Risk Assessment is in the works to ensure 2 credits under Sur2. Credits will be achieved when the site-specific Flood Risk Assessment (FRA) has been developed in accordance with good practice guidance, as outlined in PPS25 Development and Flood Risk. Two credits are achieved where the FRA confirms that there is a low risk of flooding from all sources (including sewers, drains, infrastructure failure and surface water run-off).
Waste		**0.80**	**8**	**6.40**	**8.00**	**6.40**	
Was 1	**Waste Storage & Recycling Facilities** (mandatory requirements) Mandatory Requirement: The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906. Tradable Credits are awarded for adequate internal and/ or external recycling facilities: 2 credits for provision of at least 3 internal bins 4 credits for adequate external space OR a local authority collection scheme AND 3 internal bins for recyclable waste with a minimum total capacity of 30 litres and a minimum individual capacity of at least 7 litres.	0.80	4	3.20	4	3.20	For all levels of the Code the mandatory storage requirements must be met. The space provided for waste storage is being sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906 (whichever is the greater). Storage space will provide inclusive access and usability (Checklist IDP). Containers must not be stacked. In addition to this, credits will be gained by providing adequate internal and/ or external recycling facilities. 4 credits are being targeted for the development based on an existing local authority collection scheme for recyclable waste in the borough of Camden. This offers a weekly post-sorting collection service for recyclable items. Each dwelling will therefore have a single internal storage bin for recyclable waste with a minimum capacity of 30 litres, in a dedicated internal space, such as within a kitchen cupboard to achieve full credits.
Was 2	**Construction Site Waste Management** 1 credit is awarded where a compliant SWMP is provided with specific targets and procedures to minimise construction waste, in line with Code criteria. Additional credits are available where the SWMP includes procedures and commitments for diverting either 50% (2 credits) or 85% (3 credits) of waste generated from landfill.	0.80	3	2.40	3	2.40	3 credits will be achieved as the contractor will be required to produce a compliant SWMP containing the appropriate benchmarks, commitments and procedures for waste minimisation and diversion from landfill in line with Code requirements and at least 85% by weight or by volume of non-hazardous construction waste generated by the project is diverted from landfill. A lot of contractors now produce SWMPs as standard and can achieve the above minimum waste diversion. This can be made a requirement on the contractor in order to ensure credits are met.
Was 3	**Composting** A credit is awarded where individual home composting facilities are provided, or where a community/ communal composting service, either run by the Local Authority or overseen by a management plan is in operation. In addition, a supporting information leaflet must be provided to each dwelling and the facility must meet the applicable requirements of IDP Checklist for inclusive access and usability.	0.80	1	0.80	1	0.80	The borough of Camden local authority offers a weekly food waste collection service, therefore 1 credit will be achieved.
Pollution		**0.70**	**4**	**2.80**	**4.00**	**2.80**	
Pol 1	**GWP of Insulants** A credit is awarded where all insulating materials only use substances (in manufacture AND installation) that have a GWP of less than 5.	0.70	1	0.70	1	0.70	It is expected that all M&E (building services) and architect (building fabric) specified insulants will have a GWP of less than 5 and will therefore comply for 1 credit. All insulating materials in the elements of the dwelling including: Roof; walls; floors; external doors; hot water cylinders; pipe insulation and other thermal stores and cold water storage tanks must only use substances that have a GWP < 5 (in manufacture AND installation).
Pol 2	**NOx Emissions** Credits are awarded on the basis of NO_x emissions arising from the operation of the space and water heating system within the dwelling. Dry NO_x emissions level (mg/kWh): 1 credit for ≤ 100 mg/kWh / Boiler Class 4 ((BS EN 297: 1994) 2 credits for ≤ 70 mg/kWh / Boiler Class 5 ((BS EN 297: 1994) 3 credits for ≤ 40 mg/kWh	0.70	3	2.10	3	2.10	A maximum 3 credits will be achieved through the specification of efficient low NOx gas boilers. Boilers with NOx emissions of less than 40mg/kWh will be specified in order for these credits to be awarded.
Health & Well Being		**1.17**	**12**	**14.00**	**8.00**	**9.33**	
Hea 1	**Daylighting** Credit are awarded for ensuring that key rooms in the dwelling have high daylight factors and a view of the sky. 1 credit where kitchens achieve a minimum Average Daylight Factor of at least 2%. 1 credit where all living rooms, dining rooms and studies achieve a minimum Average Daylight Factor of at least 1.5%. 1 credit where 80% of the working plane in each kitchen, living room, dining room and study must receive direct light from the sky. Rooms used for Ene 9 Home Office must also achieve a min DF of 1.5%	1.17	3	3.50	0	0.00	This credit is assumed to be not achievable for all dwellings, but effort is being made to maximise daylight wherever possible. There is potential for specifying full height glazing within living spaces in an effort to reach a daylighting factor of 1.5% in the living, dining room and study areas of each dwelling. Any space used as a Home Office will also need 1.5% average daylighting factor in order to achieve this credit. An additional credit is available where a 2% daylight factor within each kitchen is achieved. A credit is also available for direct light from the sky to 80% of the working plane. Daylight calculations will confirm which dwellings can attain credits.
Hea 2	**Sound Insulation** Credits are awarded where performance standards exceed those required in Building Regulations Part E. This can be demonstrated by carrying out pre-completion testing or through the use of Robust Details Limited. 1 credit for Airborne: 3db higher; Impact: 3dB lower 3 credits for Airborne: 5db higher; Impact: 5dB lower 4 credits for Airborne: 8db higher; Impact: 8dB lower	1.17	4	4.67	3	3.50	An acoustic insulation performance standard of 5db higher than the performance standards set out in the Building Regulations, Approved Document E (2003 Edition, with amendments 2004) to be sought for the development, for 3 credits. This will be demonstrated through a programme of pre-completion testing carried out by a 'Compliant Test Body' and based on the Normal programme of testing described in Approved Document E, for every group or sub-group of houses/flats, demonstrating that the above standards are achieved. 'Compliant Test Bodies' are organisations or individuals with UKAS accreditation or registered with the Association of Noise Consultants (ANC) Registration Scheme.

Hea 3	**Private Space** A credit is awarded for the provision of an outdoor space that is at least partially private (private garden, communal garden, balcony, roof terrace, patio). The space must be of a minimum size, allow easy access to all occupants and provided with inclusive access and usability (Checklist IDP). Minimum space requirements: Private space: 1.5 m_2 per bedroom Shared space: minimum 1 m_2 per bedroom.	1.17	1	1.17	1	1.17	A combination of balconies, roof terraces, private gardens and secure semi-private communal gardens are proposed. This will all allow Hea 3 to be achieved providing minimum space requirements are met. The design allows for minimum private or semi-private outdoor space for each dwelling, where no balcony, garden or roof terrace is provided, communal space of sufficient size which is accessible only to the occupants of the assessed buildings, will allow this credit to be achieved.
Hea 4	**Lifetime Homes** All 4 credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Mandatory Requirement: Lifetime Homes is mandatory when targeting Code Level 6.	1.17	4	4.67	4	4.67	The achievement of Lifetime Homes offers several heavily weighting credits. Camden have an expectation that "for new build developments all LHS should be adhered to. It is being investigated whether all items within the Lifetime Homes checklist is achievable. Lifetimes homes considers factors such as; approaches to all entrances (should be level or gently sloping); Communal stairs and lifts (should be fully accessible); Circulation Space within rooms; Glazing and window handle heights accessible for wheelchair users. Where a lift is provided, it should: • Have minimum internal dimensions of 1100mm x 1400mm. • Have clear landings adjacent to the lift entrance of 1500mm x 1500mm. • Have lift controls at a height between 900mm and 1200mm from the floor and 400mm from the lift's internal front wall. Existing lift shaft for Lulworth measures 2000mm x 2300mm, with adequate landing adjacent to lift entrance.
Management		**1.11**	**9**	**10.00**	**9.00**	**10.00**	
Man 1	**Home User Guide** Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code content requirements. 2 credits where the Guide is provided in accordance with Checklist Man 1, Part 1 (Operational Issues), together with confirmation that the guide is available in alternative formats. 3 credits where the guide includes additional information in accordance with Checklist Man 1, Part 2 (Site and Surroundings)	1.11	3	3.33	3	3.33	A Home User Guide will be provided for each dwelling in accordance with the Code Guidance Checklist Man 1 Part 1 (Operational Issues) and Part 2 (Site and Surroundings) in order to gain 3 credits. This must be supplied to all dwellings and available in alternative formats (e.g. translation into foreign languages, Braille, large print or audio cassette/CD).
Man 2	**Considerate Constructors Scheme** Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme. This is now operating under a new scoring strategy (as of January 2013). It is now necessary to score: Between 25-34 (with a score of at least 5 in each section) for 1 credit. Between 35-50 (with a score of at least 7 in each section) to gain 2 credits.	1.11	2	2.22	2	2.22	It is expected that a Considerate Constructors' Scheme score which is significantly beyond best practice can be achieved for the development. A contractor capable of achieving a high CCS score should be appointed. It can be made a requirement on the contractor to achieve 2 credits. CCS is now operating under a new scoring strategy (as of January 2013). It is now necessary to score between 35-50 (with a score of at least 7 in each section) to gain 2 credits. The contractor should register under the new scheme and be made aware of the scoring requirements.
Man 3	**Construction Site Impacts** Credits are awarded where there is a commitment and strategy to operate site management procedures on site as follows: 1 credit where there are procedures that cover two or more of the items listed below. 2 credits where there are procedures that cover four or more of the items listed below. <u>Monitor, report and set targets, where applicable, for:</u> - CO 2 / energy use from site activities - CO 2 / energy use from site related transport - water consumption from site activities <u>Adopt best practice policies in respect of:</u> - air (dust) pollution from site activities - water (ground and surface) pollution on site - 80% of site timber is reclaimed, re-used or responsibly sourced	1.11	2	2.22	2	2.22	At least 4 of the requirements listed within the criteria column will be met in order to achieve the full 2 credits. The contractor should be made aware of the requirements to monitor and report on at least 4 of the issues outlined for Man 3, in line with Code requirements. This can be made a requirement on the contractor.
Man 4	**Security** Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated.	1.11	2	2.22	2	2.22	An Architectural Liaison Officer (ALO) has been consulted with at an early design stage and their recommendations incorporated into the design of the dwellings to ensure that the requirements of Section 2 – Physical Security from 'Secured by Design – New Homes' are met.
Ecology		**1.33**	**9**	**12.00**	**7.00**	**9.33**	
Eco 1	**Ecological Value of Site** One credit is awarded for developing land of inherently low value.	1.33	1	1.33	1	1.33	An ecologist (from MKA Ecology) has produced an initial report based on a site survey, which confirms that the area of development is of low or insignificant ecological value. MKA Ecology have been appointed at an early stage. This credit can be achieved based on the ecologist's confirmation that the construction zone is of low or insignificant ecological value AND where any land or features of ecological value outside the construction zone, but within the development site, are protected and remain undisturbed by the construction works. Confirmation is needed that the ecologist is 'suitably qualified', as per code requirements.

Eco 2	**Ecological Enhancement** A credit is awarded where there is a commitment to enhance the ecological value of the development site. Where a Suitably Qualified Ecologist is appointed to recommend appropriate ecological features and all key recommendations and at least 30% of other recommendations are adopted by the development.	1.33	1	1.33	1	1.33	The report produced by MKA Ecology contains recommendations for the enhancement of site ecology. The types of measure suggested include: vegetation clearance outside of nesting season, the installation of a green roofs, native landscape planting and the installation of bird and bat boxes across the site. This will be achieved where all of the SQE's key recommendations and at least 30% of the additional recommendations are adopted and incorporated within the development. In addition, the suitably qualified ecologist will confirm within their report, that all UK and EU laws in respect of protected species have been complied with and that any key and additional recommendations are beyond the requirements of such laws.
Eco 3	**Protection of Ecological Features** A credit is awarded where there is a commitment to maintain and adequately protect any features of ecological value. If a suitably qualified ecologist has confirmed that a feature can be removed due to insignificant ecological value or poor health conditions, as long all the rest have been protected, then this can be targeted.	1.33	1	1.33	0	0.00	It is currently understood that some mature trees will be removed, this would mean this credit cannot be achieved.
Eco 4	**Change of Ecological Value of Site** Credits are awarded where the change in ecological value has been calculated in accordance with the Code requirements and is calculated to be: Major negative change: fewer than -9 Minor negative change: between -9 and -3 Neutral: between -3 and +3 Minor enhancement: between +3 and +9 Major enhancement: greater than 9 This can be calculated either by the suitably qualified ecologist's or through the provision of pre and post development habitats types and corresponding areas to the assessor who will use the Eco 4 Code calculator tool to calculate a change in ecological value for the site.	1.33	4	5.33	3	4.00	For 3 credits, a minor enhancement in the value of site ecology will be achieved post-development with the assistance of the appointed SQE. This will be achieved through the provision of biodiverse green roofs, native planting within communal areas, communal and private gardens and roof terraces and the creation of a valuable habitat. The SQE's report will contain the ecological value of each habitat (no. of plant species /m2) for pre and post-development and calculations showing the resultant change in ecological value for the site as a whole. The proposed plans will then reflect the ecologist's recommendation in order for this credit to be sought.
Eco 5	**Building Footprint** Credits are awarded where the ratio of combined floor area of all dwellings on the site to their footprint is: Ratio of Net Internal Floor Area: Net Internal Ground Floor Area: For 1 credit; Houses: 2.5:1 OR Flats: 3:1 For 2 credits; Houses: 3:1 OR Flats: 4:1 An area weighted average can be calculated for a combination of houses and flats, according to the Code methodology.	1.33	2	2.67	2	2.67	As one of the aims of the proposed development is to increase the current density of the site, it is expected that this credit will be achieved for the site as a whole. The construction of buildings over 4 storeys high will usually result in these credits being achieved in full (where the Net Internal Floor Area: Net Internal Ground Floor Area: is greater than 4:1 for flats and 3:1 for houses. It is expected that the average building height within the whole development will be well above 4 storeys, however, separate Code assessments will be carried out for the different phases of the development. There is therefore a possibility that the 2nd credit could be lost, if a phase contains a large number of low rise buildings. To achieve these credits in full the average Net Internal Floor Area: Net Internal Ground Floor ratio for the Phase must be greater than 4:1 for flats and 3:1 for houses. An area weighted average can be calculated for a combination of houses and flats within each Phase.
Totals				**107**	**100**	**73**	**72.25**

Table 1.6: Relationship Between Total Percentage Points Score and Code Level

Total Percentage Points Score (equal to or greater than)	Code Levels
36 Points	Level 1 (★)
48 Points	Level 2 (★★)
57 Points	Level 3 (★★★)
68 Points	Level 4 (★★★★)
84 Points	Level 5 (★★★★★)
90 Points	Level 6 (★★★★★★)

Level 4	**72.25**	Level 4, with 4.25% margin for error.

APPENDIX A5 ENERGY & SUSTAINABILITY STRATEGY FOR LULWORTH REFURBISHMENT

9.12 Policy Context National

National Planning Policy Framework (NPPF) was released in March 2012; this replaced all national planning policy statements and guidance. The document formalised a presumption in favour of sustainable development, and sets out the requirement to provide for much needed new homes and to encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy)

9.13 Policy Context: Regional

The London Plan (2011) is the overall strategic, forming part of the statutory Development Plan for Greater London. It sets out the London-wide policy context within which London boroughs should set their detailed local planning policies. It also forms the policy framework for the Mayor's own decisions on the strategic planning applications referred to the Greater London Authority.

Policy principles in the London Plan 2011 that are relevant to this report include:

5.1 Climate change mitigation
5.2 Minimising carbon dioxide emissions
5.3 Sustainable design and construction
5.4 Retrofitting
5.7 Renewable energy
5.8 Innovative energy technologies
5.9 Overheating and cooling
5.11 Green roofs and development site environs
5.12 Flood risk management
5.13 Sustainable drainage
5.14 Water quality and wastewater infrastructure
5.15 Water use and supplies
5.18 Construction excavation and demolition waste
6.1 Strategic transport approach
6.9 Cycling
6.10 Walking
7.14 Improving air quality
7.15 Reducing noise and enhancing soundscapes
7.19 Biodiversity and access to nature

London Plan Policy 5.2
Development proposals should follow the Energy Hierarchy:

4. **Be Clean: use less energy**
5. **Be clean: supply energy efficiently**
6. **Be green: use renewable energy**

London Plan Policy 5.4
LDFs should look for opportunities for reducing carbon dioxide emissions from the existing building stock by identifying potential synergies between new developments and existing buildings through the retrofitting of energy efficiency measures, decentralised energy and renewable energy opportunities.

Figure A5.1 - The London Plan 2011 and The Mayor's Sustainable Design & Construction SPG documents

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9.14 Policy Context: Local

Camden has the following Development Policy documents relevant to the project:

DP22 Promoting sustainable design and construction
The Council encourages refurbished developments to achieve "Excellent" in EcoHomes assessments from 2013. (Note Ecohomes has been replaced by Breeam Domestic Refurbishment).

Developments should be resilient to climate change: include appropriate adaptation measures, such as: summer shading and planting; limiting run-off; reducing water consumption; reducing air pollution;

Developments should demonstrate how sustainable development principles have been incorporated.

Scheme	Minimum rating	Minimum standard for categories (% of un-weighted credits)
BREEAM Domestic Refurbishment	'Excellent'	• Energy 60% • Water 60% • Materials 40%

Table A5.1 - Supplementary Planning Guidance CPG3 Sustainability Assessment schemes rating requirements

DP24 Securing high quality design
The Council is committed to design excellence and a key strategic objective of the borough is to promote high quality, sustainable design. This is not just about the aesthetic appearance of the environment, but also about enabling an improved quality of life, equality of opportunity and economic growth.

Supplementary Planning Guidance CPG3 Sustainability

Energy efficiency: existing buildings
All buildings, whether being updated or refurbished, are expected to reduce their carbon emissions by making improvements to the existing building. Work involving a change of use or an extension to an existing property is included. As a guide, at least 10% of the project cost should be spent on the improvements.

Decentralised energy networks and combined heat and power:
Where feasible and viable developments must connect to a decentralised energy network or include CHP. Where there is more than one occupier, use or building a community heating network is expected.

Renewable energy
Developments should target a 20% reduction in CO_2 emissions from on-site renewables. The SPG provides specific guidance on each renewable – each should be considered in detail:

- Solar thermal: larger schemes should use a central system.
- PVs: preference is for panels to be flush to the roof or wall, but considerations will include the efficiency of the panel/s and whether they are visible.

Sustainable use of materials

- Reduce waste by firstly re-using your building,
- Major developments are anticipated to be able to achieve 15-20% of the total value of materials used to be derived from recycled and reused sources.
- Incorporation of a 'material salvage phase' for recovering construction materials is encouraged

9.15 Buildings Regulations

Part L 2013 is expected to come into force in April 2014. The standards have not yet been released.

The refurbished flats in Lulworth are being designed to Part L1b standards. The new commercial units will be designed to Part L2a standards

Dwellings in existing elements: Building Regulations Part L1b (2013)
The exact requirements of Part L 2013 Building Regulations are not yet known but are expected to be similar to that of Part L1b 2010. Part L1b (2010) sets out the minimum performance standards for refurbished dwellings. A threshold U-value is given for each element of the building. If the existing fabric exceeds any of these figures, the corresponding element must be upgraded to the target value.

Where a thermal element is replaced it should comply with the minimum requirements of Part L1a.

10% of the cost of refurbishment should be spent on environmental improvements.

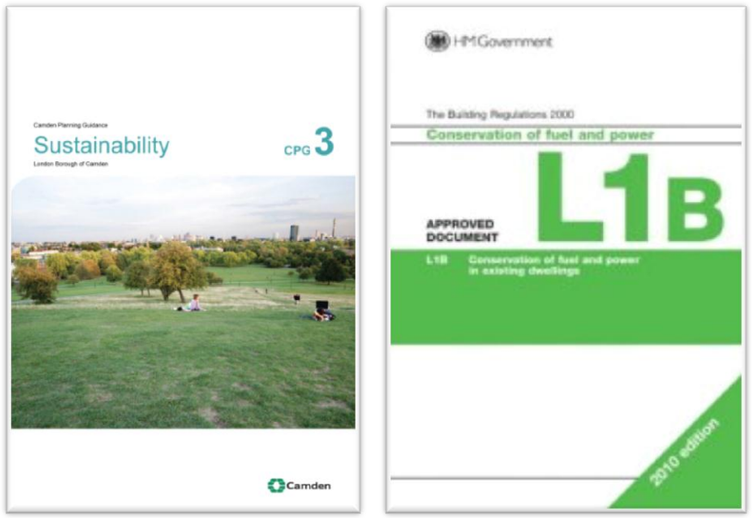

Figure A5.2 – Camden sustainability policy guidance.

9.16 Lulworth House energy strategy

Lulworth will have a full decant with all new fabric and services, except for retaining the concrete core and frame. The EPC ratings that have been retained for the existing flats show ratings of C or D.

The new homes will be built to much improved standards with U-values as presented in the table below.

Building fabric	W/m^{2}K
Ground floor	0.15
Roof floor	0.15
Walls	0.2
Windows	1.5

Table A5.3 – Proposed U-values for new build elements of Lulworth House

Many of the 'be lean' type measures used in the new-build apartments will be applied to Lulworth refurbishment. However, the specification will not in this case be taken to Passivhaus levels.

Passive energy savings on regulated loads will be achieved by a number of energy saving initiatives such as:

- The provision of high thermal performance by means of increased insulation and triple glazed window systems to reduce heat loss
- Close attention will be paid to detailing to avoid thermal bridging of insulation in the building fabric
- Air-tight construction techniques such as a dedicated air barrier in the envelope to minimise unwanted air infiltration, certified air-tight windows and post completion air-pressure testing to ensure compliance with design standards
- Reducing summertime overheating by allowing decent natural ventilation: by providing generous proportioned purge ventilation openings, secure night ventilation panels where necessary, acoustic absorption where necessary. This avoids requirement for electric cooling
- Reducing summertime overheating by controlling solar gains by balanced window sizes, internal blinds, external movable shutters, or solar control glass where necessary. This avoids requirement for electric cooling
- Adequate sized windows for good even daylighting- this improves the 'feel' of a room, and also reduces electrical lighting use
- Heat recovery ventilation system- efficient mechanical ventilation with heat recovery (MVHR)
- Provision of a simple user's guide to assist in using the homes in the best way
- Water saving measures such as spray taps. Water use will be less than 105 l/person/day, as assessed by Code for sustainable homes Wat1 calculator. This will save water and heating fuel
- Light controls in corridors and low energy light fittings
- Energy A-rated appliances will be used to save on energy and water
- Simple, well understood (by installer and user) and robust mechanical and electrical services. The block-by-block arrangement of plant rooms especially assists with this when compared to a site wide district heating scheme: the smaller scale allows simple low pressure and low temperature systems.
- Time and zoned temperature-controlled heating using controls which are easy to use.
- Generously sized pipes and ducts, variable speed controls, weather compensated controls, all to minimise pump and fan power.

Heat will be generated by a block gas boiler, and distributed by a high-efficiency low loss LTHW distribution system. This will distribute to heat interface units in each apartment. No be green renewables are required to meet the performance targets. The efficiency of the form and of the fabric ads systems is alone enough to achieve these onerous targets. The PVs on the roof of Lulworth are contributing to the site-wide carbon reduction targets presented in earlier sections.

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APPENDIX A6 BREEAM DOMESTIC REFURBISHMENT

9.17 Introduction

The Code for Sustainable Homes is only used to assess new build projects and cannot be used to assess a refurbishment. The Domestic Refurbishment methodology provides a much more suitable and effective way of assessing the unique requirements brought about by refurbishments. Therefore, the refurbishment of Lulworth House will be assessed under this scheme. Generally speaking, there are many similarities between the two schemes, but the differences that do exist will enable the separate parts of the redevelopment to be assessed more effectively.

9.18 Building Research Establishment Environmental Assessment Method

BREEAM Domestic Refurbishment is a performance based assessment method and certification scheme for domestic buildings undergoing refurbishment. The primary aim of BREEAM Domestic Refurbishment is to improve the environmental performance of existing dwellings in a robust and cost effective manner. The scheme assesses alterations to existing dwellings and extensions as well as domestic conversions and change of use projects.

9.19 Scoring and Rating

The scheme has seven categories with an additional category for Innovation. BREEAM uses a weighting system that determines the relative value of each category and its contribution to the overall BREEAM score. The table below summarises the number of credits in each section and the relative weighting of the credits as a percentage of the assessment as a whole.

The overall performance of a BREEAM Domestic Refurbishment project is determined using the above scoring and weighting system, along with performance in the minimum BREEAM standards, rating level benchmarks and assessment issues and credits.

BREEAM SECTION	NO. CREDITS AVAILABLE	% WEIGHTING	VALUE OF EACH CREDIT (%)
Management	11	12	1.09
Health & Wellbeing	12	17	1.42
Energy	29	43	1.48
Water	5	11	2.2
Materials	45	8	0.17
Pollution	8	6	0.75
Waste	5	3	0.60
TOTAL	**115**	**100**	
Innovation (additional)	*10*	*10*	*1.00*

Table A6.1 - Breeam sections

BREEAM Domestic Refurbishment Ratings

The number of credits achieved in each section is totalled to give a percentage score. An overall rating of the building's performance is given using the terms **Pass, Good, Very Good, Excellent** or **Outstanding**. This is determined from the total number of BREEAM criteria met and their respective environmental weightings. The building's rating is displayed on a certificate that can be displayed in the building or used for marketing purposes. The target score for each level can be seen in in Table below.

BREEAM RATING	% SCORE
Outstanding	85
Excellent	70
Very Good	55
Good	45
Pass	30
Unclassified	<30

Table A6.2 – BREEAM Score rating thresholds

9.20 Camden Policy

The Borough of Camden's Supplementary Planning Guidance CPG3 Sustainability required that a BREEAM Excellent is achieved and that the following sections of BREEAM Domestic Refurbishment gain a minimum percentage score as detailed:

Minimum Standard for Categories (% of un-weighted credits)
• Energy 60% • Water 60% • Material 40%

Table A6.3 – Camden CPG 3 Minimum standards for Breeam Domestic Refurbishment

9.21 Minimum Standards

To ensure performance against fundamental environmental issues is not overlooked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas. These are summarised in the table below

	MINIMUM STANDARDS BY BREEAM RATING LEVEL				
BREEAM ISSUE	**PASS**	**GOOD**	**VERY GOOD**	**EXCELLENT**	**OUTSTANDING**
Ene 02: Energy Efficiency Rating Post Development	0.5 Credits	1.0 Credits	2 Credits	2.5 Credits	3.5 Credits
Wat 01: Internal Water Use	-	-	1 Credit	2 Credits	3 Credits
Hea 05: Ventilation	1 Credit	1 Credit	1 Credit	1 Credit	1 Credit
Hea 06: Safety	1 Credit	1 Credit	1 Credit	1 Credit	1 Credit
Pol 03: Flooding	-	-	-	2 Credits	2 Credits
Mat 02: Responsible Sourcing of Materials	Criterion 3 only (Timber)	Criterion 3 only (Timber)	Criterion 3 only (Timber)	Criterion 3 only (Timber)	Criterion 3 only (Timber)

Table A6.4 - Breeam minimum standards for Excellent

9.22 Additional BREEAM Issues targeted on Lulworth House

Non-mandatory, tradable credits have been selected for the Lulworth House **worst case** scenario and are listed below in the table below. The achievement of these credits would produce a BREEAM score of **77.98%,** an 'Excellent' (where a minimum of 70% is required).

This scenario therefore has a margin for error of 7.98% in targeting 'Excellent', which more than meets the recommended 5-6% above minimum target.

Ventilation
The refurbishment of Lulworth House will be an extensive and detailed process. The building fabric is being completely stripped back and re-built, meaning the development is able to meet 'new build' standards. In this respect, the dwellings will be able to meet the requirements of section 5 of Building Regulations Part F in full. Levels of background, extract and purge ventilation will be identified and then compared to targeted levels.

Energy
The way energy is assessed under BREEAM Domestic Refurbishment differs slightly from other schemes. There will of course still be the provision of cycle storage, drying space, energy meters, home offices, etc. But, as the existing building fabric is being improved upon, the calculation procedures have been designed to reflect this. The design team have collected existing EPC certificates for Lulworth House to be used as a baseline. From here, the development achieves credits for the improvement of the dwellings' energy efficiency rating (EER) from pre to post refurbishment. Similarly, credits are also awarded for the EER post refurbishment in itself, irrespective of the improvement. The dwellings are expected to score well in this section, with 3.5 out of the 4 credits being achieved.

Another aspect of the energy assessment is the overall primary energy demand, in which the dwellings will also score well. 6 out of 7 credits will be achieved for having a low primary energy demand of ≤160 kWh/m2/year. In an effort to further reduce CO2 emissions. The energy strategy for Lulworth House has resulted in the refurbishment exceeding Camden's requirement of achieving 60% of the energy credits.

Water
Similar to the requirements under the Code, low flow water fittings will be specified to the dwellings. Camden sets the requirement of achieving 60% of the credits under this section and the provision of efficient water fittings and sanitary ware will contribute to exceeding this requirement comfortably. On top of this, rainwater harvesting systems will be installed to provide water for irrigation of communal gardens.

BREEAM Credit Issue	Credits Targeted	% of Total Score
Man 1 - Home User Guide	3/3	3.27
Man 2 - Responsible Construction Practices	2/2	2.18
Man 3 - Construction Site Impacts	1/1	1.09
Man 4 - Security	2/2	2.18
Man 5 - Protection and Enhancement of Ecological Features	1/1	1.09
Man 6 - Project Management	2/2	2.18
Hea 2 - Sound Insulation	4/4	5.68
Hea 3 - Volatile Organic Compounds	1/1	1.42
Hea 4 - Inclusive Design	2/2	2.84
Hea 5 - Ventilation	2/2	2.84
Hea 6 - Safety	1/1	1.42
Ene 1 - Improvement in Energy Efficiency Rating	1/6	1.48
Ene 2- Energy Efficiency Rating Post Refurbishment	4/4	5.93
Ene 3 - Primary Energy Demand	7/7	10.38
Ene 5 - Energy Labeled White Goods	1/2	1.48
Ene 6 - Drying Space	1/1	1.48
Ene 7 - Lighting	2/2	2.96
Ene 8 - Energy Display Devices	2/2	2.96
Ene 9 - Cycle Storage	1/2	1.48
Ene 10 - Home Office	1/1	1.48
Wat 1 - Internal Water Use	2/3	4.4
Wat 2 - External Water Use	1/1	2.2
Wat 3 - Water Meter	1/1	2.2
Mat 1 - Environmental Impact of Materials	10/25	1.7
Mat 2 - Responsible Sourcing of Materials	6/12	1.02
Mat 3 - Insulation	6/8	1.02
Pol 1 - Nitrogen Oxide Emissions	3/3	2.25
Pol 2 - Surface Water Runoff	3/3	2.25
Pol 3 - Flooding	2/2	1.5
Was 1 - Household Waste	2/2	1.2
Was 2 - Refurbishment Site Waste Management	3/3	2.25

Table A6.5 – Breeam credits targeted and associated scores

Materials
Similar to the energy section, materials are assessed slightly differently under BREEAM Domestic Refurbishment. The Green Guide to Specification is consulted and materials specified as to their environmental impact, as with Code for Sustainable Homes. However, there is an additional element for refurbishments. The U-values of thermal elements are calculated before and after the refurbishment and credits awarded accordingly, along with their respective Green Guide ratings. The extensive refurbishment process Lulworth House is going through means that relatively high standards can be achieved under this section. This means that the development is able to meet Camden's requirement of 40% of the available credits. Also contributing to reaching this target is the specification of insulants with low embodied impact and responsible sourcing of the specified materials.

9.23 Meeting Camden Policy

As stated earlier, Camden has minimum requirements for standard categories as a % of un-weighted credits. The worst case scenario presented achieves the following section weightings. As can be seen all the minimum section scores are exceeded.

Categories	Camden requirements	Lulworth House worst case
Energy	60%	69%
Water	60%	80%
Materials	40%	49%

Table A6.6 – Lulworth House expected section scores

MAX FORDHAM

BREEAM Domestic Refurbishment
Agar Grove - Pre-Assessment
Score Summary
Issue: 15/11/2013

MAX FORDHAM

KEY:

Mandatory element for excellent

		Credits Available	Mandatory for Excellent	Targeted Credits	Score	Comments
Managemnet	**Criteria**					
Man 1	**Home User Guide** 3 Credits are available where a home user guide is provided to all homes containing information listed in the 'User Guide Contents List'.	3		3	3.27	A Home User Guide will be produced that covers all items listed on the User Guide Contents List.
Man 2	**Responsible Construction Practices** Achieve a point score of 35 or above under the Considerate Constructor's scheme, with a score of at least 7 in each of the 5 sections (under the new scoring system, updating as of January 2013).	2		2	2.18	A contractor capable of achieving a high CCS score will be appointed. It can be made a requirement on the contractor to achieve 2 credits. The contractor will register under the new scheme and be made aware of the scoring requirements.
Man 3	**Construction Site Impacts** Where there is evidence to demonstrate that 2 or more of the sections a-e in Appendix A: Man 03 are completed.	1		1	1.09	The contractor will be made aware of the requirements to monitor and report the issues outlined for Man 3, in line with the requirements. This can be made a requirement on the contractor.
Man 4	**Security** 1 credit where retained external doors and accessible windows comply with the minimum security requirements as set out in the BREEAM manual under Man04 and where newly added external door sets and windows are appropriately certified. 1 credit where Secured by Design principles are followed and an ALO has been consulted early in the design stage and their recommendations incorporated into the refurbishment specification.	2		2	2.18	An Architectural Liaison Officer (ALO) has been appointed at an early stage and their recommendations are being incorporated into the design. Secured by Design principles are also being followed. Retained external doors and accessible windows will comply with the minimum security standards set out in the BREEAM manual and newly installed external doors and windows will be properly certified.
Man 5	**Protection and Enhancement of Ecological Features** A site survey is carried out by suitably qualified ecologist, and all existing features of ecological value on the site potentially affected by the works, are maintained and adequately protected during refurbishment works.	1		1	1.09	MKA Ecology have been appointed at an early stage and are working with the design team to ensure all existing features of ecological value on the site potentially affected by the works are protected.
Man 6	**Project Management** First Credit - Where roles and responsibilities are assigned in accordance with the defined project stages. Second Credit - Where a handover meeting is held and at least 2 aftercare commitments are made: i.e. 1) site inspection within 3 months of occupation. 2) post occupancy interviews within 3 months of occupation are conducted 3) longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation. Exemplary Credits available – BREEAM AP appointed to oversee key stages.	2		2	2.18	Evidence is being collected of the individual and shared responsibilities assigned by the project manager across the following key design and refurbishment stages: • Planning and Building control notification • Design • Refurbishment • Commissioning and handover • Occupation Handover meetings and aftercare are being set up.
Health and Well Being		**11**		**11**	**12.00**	
Hea 1	**Daylighting** The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study with "no" answered for all questions in Appendix A: Hea 01 , parts 1 and 2 (for existing dwellings) or parts 3 and 4 (for change of use e.g. conversions). Where the property is being extended: new spaces achieve minimum daylighting levels (kitchen; 2%), living room, dining room, study; 1.5%) and the extension does not reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties. For a second credit the dwelling achieves minimum daylighting levels in the kitchen (2%), living room, dining room and study (1.5%).	2		0	0.00	This credit is assumed to be not achievable for all dwellings, but effort is being made to maximise daylight wherever possible.
Hea 2	**Sound Insulation** Credits are awarded depending on the type of dwelling and whether they are subject to sound testing. Where sound testing has been carried out and where the dwelling meets or goes beyond Regulations, up to four credits may be awarded according to the sound insulation credit requirements as follows: 2 credits - Part E compliance; 3 credits - 3dB higher than Part E; 4 credits - 5dB higher than Part E. A minimum of 2.5 credits must be achieved in order to target BREEAM Excellent.	4	2.5	4	5.67	An acoustic insulation performance standard of 5db higher than the performance standards set out in the Building Regulations, Approved Document E is sought for 4 credits. Testing results from an SQA will confirm the sound insulation credit requirements are met for impact and airborne sound for all separating walls and floors. Specification details confirming that separating walls and floors meet the requirements set out in Part E with compliant construction details.

Hea 3	**Volatile Organic Compounds** Where all decorative paints and varnishes used in the refurbishment have met the requirement in Table - 15, within the Hea 3 section of the manual. Where at least five of the eight remaining product categories listed have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified in Table - 15.	1		1	1.42	All decorative paints and varnishes will meet the relevant requirements.
Hea 4	**Inclusive Design** An access expert or suitably qualified member of the design team (has completed sections 1 and 2 of Appendix A: Hea 04 with evidence provided of the measures implemented in the refurbishment and the access statement demonstrates reasonable provision to provide accessibility to the dwelling covering sections 1 and 2 of Checklist A-8.	2		2	2.83	For 2 credits, an access expert or suitably qualified member of the design team will complete section 1 and 2 of Checklist A-8.
Hea 5	**Ventilation** Two credits are awarded when the ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full (N.B. Where the building is a historic building and meets the requirements for Historic Buildings). A minimum of 1 credit is required in targeting BREEAM Excellent.	2	1	2	2.83	The full 2 credits have been targeted meaning the dwelling will meet the requirements of section 5 of Building Regulations Part F in full. Current levels of background, extract and purge ventilation in the dwelling will be identified and compared with the requirements for compliance.
Hea 6	**Safety** Fire and carbon monoxide (CO) detection and alarm systems are provided. This credit is a mandatory requirement in targeting BREEAM Excellent.	1	1	1	1.42	Fire and carbon monoxide (CO) detection and alarm systems to be provided to each dwelling.
Energy		**12**		**10**	**14.17**	
Ene 1	**Improvement in Energy Efficiency** The refurbishment results in an improvement to the dwellings Energy Efficiency Rating. This issue is assessed using the Energy calculator and SAP or RdSAP - credit allocation is based on exceeding EER improvement benchmarks, from the baseline EER.	6		1	1.48	1 Credit has been targted based on an average improvement in Energy Efficiency of ≤ 9. Detailed calculations using current EPC certificates as a baseline have be used to compare pre and post refurbishment EER.
Ene 2	**Energy Efficiency Rating Post Refurbishment** Where as a result of refurbishment, the dwelling meets a minimum Energy Efficiency Rating, credits can be awarded. BREEAM Excellent level requires a minimum EER of 70.	4	2.5	4	5.93	4 credits have been targeted based on calculations showing that an average energy efficiency rating of ≥ 85 can be met.
Ene 3	**Primary Energy Demand** Where as a result of refurbishment the dwelling meets the Primary Energy Demand targets in kWh/m2/year. (credit scale ranges from 0.5 credits for 400 kWh/m2/year to 7 credits for ≤120 kWh/m2/year).	7		7	10.38	SAP calculations show that all the flats that have been modelled will achieve 7 credits under Ene 3.
Ene 4	**Renewables** Where at least 10% of the Primary Energy Demand pa is provided by LZCs AND the dwelling has reduced energy demand prior to the specification of renewables with a maximum Primary Energy Demand of 220 kWh/m2/year (for flats). OR Where for mid to high rise flats at least 15% of each dwellings Primary Energy Demand per annum is supplied by low or zero carbon technologies AND the dwelling has reduced energy demand as per above (for 2 credits).	2		0	0.00	Currently 0 credits are targted for Ene 4. SAP calculations are being completed to assess this further.
Ene 5	**Energy Labelled White Goods** 1 credit – energy labelled fridges, freezers and fridge-freezers or where no white goods EU labelling scheme. 2nd credit – energy labelled washing machines, dishwashers, tumble dryers and washer dryers or EU labelling scheme.	2		1	1.48	Where no white goods are provided, 1 credit will be gained by providing an EU Energy Efficiency Labelling Scheme Information Leaflet to all dwellings.
Ene 6	**Drying Space** An adequate, secure internal or external space with posts and footings, or fixings holding: 4m+ of drying line for 1-2 bedrooms, 6m+ of drying line for 3+ bedroom dwellings.	1		1	1.48	Internal drying space to be provided as a heated space with adequate, controlled ventilation, complying with Building Regulations Approved Document F Ventilation 2006, for example in the bathroom. The fixing/fitting will be a permanent feature of the room.
Ene 7	**Lighting** One credit – External lighting Where Energy Efficient Space lighting (including lighting in communal areas) and Energy Efficient Security lighting is provided. Or where Energy Efficient Space lighting (including lighting in communal areas) and no Security Lighting is provided One credit - Internal Lighting One credit is awarded where the energy required for internal lighting is minimised through the provision of a maximum average wattage across the total floor area of the dwelling of 9 watts/m2	2		2	2.97	Energy efficient external space and security lighting is being specified to the dwellings. Existing lighting is being assessed to see whether it meets definition of energy efficient. Quality of all internal lamps is being determined, the wattage of each lamp and the m2 of the dwelling.

Ene 8	**Energy Display Devices** Where current electricity AND primary heating fuel consumption data are displayed to occupants by a compliant correctly specified Energy Display Devices.	2		2	2.97	An Energy Display Device which monitors the use of both electricity and primary heating fuel to be provided to each dwelling.
Ene 9	**Cycle Storage** 1 credit where individual or communal compliant cycle storage is provided for the following number of cycles: Studios or 1 bedroom dwellings – storage for 1 cycle for every two dwellings; 2 and 3 bedroom dwellings – storage for 1 cycle per dwelling; 4 bedrooms and above – storage for 2 cycles per dwelling. 2 credits at the following numbers: Studios or 1 bedroom dwellings – storage for 1 cycle per dwelling, 2 and 3 bedroom dwellings – storage for 2 cycles per dwelling, 4 bedrooms and above – storage for 4 cycles per dwelling.	2		1	1.48	The cycle provision is currently being led by the planning requirement which sits somewhere between the provision for 1 and 2 code credits. Cycle storage should be covered, fixed and secure, adequately spaced and within 100m of the main entrance.
Ene 10	**Home Office** Where sufficient space and services have been provided which allow the occupants to set up a home office in a suitable room with adequate ventilation.	1		1	1.48	Home Offices will be provided to meet the following requirements: Suitable Room: For dwellings with three or more bedrooms, a suitable room is defined as a room other than the kitchen, living room, master bedroom or bathroom. For dwellings with one or two bedrooms or studio homes, a suitable room is defined as a room other than the kitchen, living room or bathroom, however may be within the master bedroom. Sufficient Services: two double power sockets, telephone point, window and adequate ventilation (openable window or alternative). Sufficient Space: minimum of 1.8m wall length
Water		**29**		**20**	**29.66**	
Wat 1	**Internal Water Use** Wat 1 calculator is used to confirm the internal water consumption in litres/per person/day. For BREEAM Excellent a maximum Water consumption of between 107-117 l/p/day (2 credits awarded) must be achieved.	3	2	2	4.4	Low flow fittings using the Wat 1 calculator for reference will be specified to all dwellings.
Wat 2	**External Water Use** Where gardens are present a compliant rainwater collection system for external/internal irrigation use must be provided to dwellings. The rainwater collection system (e.g. rainwater butts) volume requirements for homes with communal gardens are as follows: 1 litre/m2 of land allocated to the dwelling with a minimum of 200 litres per communal garden. Where the communal garden is allocated to more than 6 dwellings, a maximum of 30 litres per dwelling can be applied. The allocated land can either be planted (including grass) or left as unplanted soil and can be either split into plots or communally maintained. Where dwellings have no individual or communal garden space this is achieved by default.	1		1	2.2	In order to gain this credit, a central rainwater collection system will be specified to provide water for irrigation as well as individual water butts where necessary.
Wat 3	**Water Meter** Where an appropriate water meter for measuring usage of mains potable water has been provided to dwelling/s.	1		1	2.2	An appropriate water meter for measuring usage of mains potable water will be provided to the dwellings. A meter that provides a visible display of mains potable water consumption to occupants. The meter will be a permanent feature secured within the home in a location visible to occupants and capable of recording and displaying historic water consumption to allow water consumption to be monitored over time. The meter will be capable of displaying current consumption either instantaneously or at half hourly intervals. Where an existing water meter is in place, one credit can be awarded where it meets the requirements.
Materials		**5**		**4**	**8.8**	
Mat 1	**Environmental Impact of Materials** Credits are awarded, using the Mat 1 calculator, according to the impact of new materials according to their Green Guide Rating and their impact on improving the thermal performance of the dwelling for the following elements: Roof; External walls; Internal walls (including separating walls); Upper and ground floors; Windows.	25		10	1.78	The U-Values of existing thermal elements are being calculated to be used along with the Green Guide in order to achieve 10 out of 25 credits.
Mat 2	**Responsible Sourcing of Materials** The applicable new materials for refurbished building elements are assigned a responsible sourcing tier level, achieving points on a scale form tier 1- 4 points to tier 8- 0 points. The Mat 2 calculator determines the level of credits available based on the score achieved with ≥54% of the points achieved receiving 12 credits and ≥ 9% of the points receiving only 2 credits. IN ADDITION all new timber used in the project must be sourced in accordance with the UK Government's Timber Procurement Policy (the timber requirement is mandatory at all levels).	12	Timber criteria only	6	1.07	These credits and are difficult to achieve, involving a long time-consuming paper trail. 6 of the available credits is targeted for the development. This will require a significant commitment from the team and engagement by the contractor at an early stage, to ensure that an adequate amount of material is responsible sourced. The number of credits are calculated using the Mat 2 calculator. 80% of the assessed materials must be responsibly sourced (i.e. suppliers covered by EMS e.g. ISO 14001 and/or Chain of Custody e.g. FSC timber) to contribute to the credit score. 100% of any timber must be legally sourced. Further details of how to achieve these credits can be provided by the assessor on request.

Mat 3	**Insulation** Pre-requisite - Any new insulation specified for use within the following building elements must be assessed: External walls; Ground floor; Roof; Building services. 4 Credits - Embodied Impact Where the Insulation Index for new insulation used in the buildings is ≥ 2 and is calculated using the BREEAM Domestic Refurbishment Mat 03 Calculator. Where Green Guide ratings, required by the BREEAM Domestic Refurbishment Mat 03 Calculator are determined using the Green Guide to specification tool. 4 Credits - Responsible Sourcing Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.	8		6	1.07	6 out of the 8 credits available has been targeted. The new insulation will be assessed using the Insulation Index for new insulation, the Mat 3 calculator, Green Guide and EMS criteria (as in Mat 2).
Pollution		**45**		**22**	**3.91**	
Pol 1	**Nitrogen Oxide Emissions** Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows: One credit where the dry NOx emissions of space heating and hot water systems are ≤ 100 mg/kWh (NOx class 4 boiler). Two credits where the dry NOx emissions of space heating and hot water systems are ≤ 70 mg/kWh (NOx class 5 boiler). Three credits where the dry NOx emissions of space heating and hot water systems are ≤ 40 mg/kWh.	3		3	2.25	A maximum 3 credits will be achieved through the specification of efficient low NOx gas boilers. Boilers with NOx emissions of less than 40mg/kWh will be specified in order for these credits to be awarded.
Pol 2	**Surface Water Runoff** An appropriately qualified professional should be used to design an appropriate drainage strategy for the site. Where run-off as a result of the refurbishment is managed on site using source control achieving the following requirements: The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site. The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%. An allowance for climate change must be included for all of the above calculations, in accordance with the current best practice (PPS25, 2010)	3		3	2.25	PBA are currently working on the drainage and attenuation strategy for the site, with 3 credits targeted.
Pol 3	**Flooding** A minimum of two credits must be achieved for this issue at Excellent level. This can be achieved where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding or Where the FRA defines flood risk as medium or high annual probability of flooding AND complaint and sufficient flood mitigation has been undertaken by following Checklist A-10; Decision Strategy Flow Chart or, Where avoidance is not possible, implementing a full flood resilience/resistance strategy for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional.	2	2	2	1.5	PBA confirm the site is in Flood Zone 1 'low probability' and that a Flood Risk Assessment is in the works to ensure 2 credits under Pol 3.
Waste		**8**		**8**	**6**	
Was 1	**Household Waste** Provision of adequately sized recycling facilities (internal/external storage) and provision of composting facility for garden/green waste and kitchen waste for dwellings with significant external space as well as provision of internal composting bin.	2		2	1.2	Adequately sized recycling facilities (interna& external) will be provided to all dwellings. The local authority food waste collection service will also serve the dwellings.
Was 2	**Refurbishment Site Waste Management** For projects over 300k a compliant Level 2 SWMP is in place AND Best practice waste benchmarks are in place.	3		3	2.25	For 3 credits, the contractor will be required to produce a compliant SWMP containing the appropriate benchmarks, commitments and procedures for waste minimisation and diversion from landfill. These credits are being targeted in full. A lot of contractors now produce SWMPs as standard and can achieve the above minimum waste diversion. This can be made a requirement on the contractor in order to ensure credits are met.
Innovation		**5**		**5**	**3.45**	
Inn 1	**Innovation** Where the building demonstrates exemplary performance by meeting defined exemplary level performance criteria in one or more of following BREEAM assessment issues: Ene 2 Energy Efficiency Rating (2 exemplary credits available); Ene 8 Display Energy Devices (1 exemplary credit available); Wat 1 Internal Water Use (1 exemplary credit available); Was 2 Refurbishment Site Waste Management (1 exemplary credit available); Pol 2 Surface Water Run-off (1 exemplary credit available); Man 2 Responsible Construction Practices (1 exemplary credit available); Man 5 Protection and Enhancement of Ecological Value (1 exemplary credit available); Man 6 Project Management (2 exemplary credits available); Hea 4 Inclusive Design (1 exemplary credit available).	10		0	0	No innovation credits are being targeted
BREEAM Domestic Refurbishment Pre-Assessment Score (where >70 is an Excellent)					**77.98%**	

MAX FORDHAM

APPENDIX A7 COPY OF GLA EMAIL RESPONSE TO PRE-APPLICATION INFORMATION

Incoming Email

from
Charles Moran
<charles.moran@cma-planning.co.uk>
on
31/10/2013 14:29

Create Mail Reply

File Ref 1 Planning Consultant
File Ref 2 None
File Ref 3 None

To: sally@peterwarm.co.uk
cc: b.dixon@maxfordham.com
Subject: FW: 3231 Agar Grove Estate Pre-app

Associated Documents

created by: Charles Moran on 31-Oct-13

Charles Moran

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From: David Blankson-Hemans [mailto: David.Blankson-Hemans@london.gov.uk]
Sent: 30 October 2013 18:24
To: Charles Moran (charles.moran@cma-planning.co.uk)
Subject: FW: 3231 Agar Grove Estate Pre-app
Importance: High

Dear Charles,

I presented a report for debate with the Deputy Mayor and Chief of Staff, Sir Edward Lister on Monday as planned.

The conclusion of our deliberations was a clear preference in favour of a site-wide heat network fed from a central energy centre for future connection to a district heating network . Sir Edward suggested, however, that your planning application should include as much evidence as you possibly can to justify, especially on long-term benefits, the Council's circumstances and viability grounds, why Passivhaus is a particularly appropriate strategy for this estate renewal scheme; together with some kind of undertaking or assurance that the long-term benefits of that strategy would be delivered as proposed. Lastly, your client's attention was drawn to the GLA's recent adoption of a

40% reduction in regulated CO2 emissions.

I trust this answers your pre-application inquiry but will be happy to assist with any further clarification you may require.

Kind regards

David.

David Blankson-Hemans
Senior Strategic Planner
Greater London Authority
City Hall
The Queen's Walk
LONDON SE1 2AA
Tel: 020 7983 4268
Fax: 020 7983 4706

From: Jonathan Williams
Sent: 24 October 2013 11:19
To: David Blankson-Hemans
Cc: Kizzian Owen; Keith Routledge; Georgia Franco
Subject: RE: 3231 Agar Grove Estate Pre-app

David,

Having read the applicant's document, below in italics is the summary you requested I prepare in your email.

Jonathan

SUMMARY

Policy Background

- *The London Plan requires development's to achieve a 40% reduction in CO2 emissions compared to 2010 Building Regulations compliance*
- *The percentage reduction achieved by developments is measured using CLG's Building Regulations compliance tools*
- *Policy 5.6 requires developments to take measures to facilitate connection to external district heating networks*

Applicant's Proposal
In relation to the London Plan energy hierarchy, the applicant is proposing:

Be lean

- *To minimise the demand for energy as far as possible by adopting the 'PassivHaus' design standard.*
  - *This element of the approach is fully consistent with the first element of the Mayor's Energy Hierarchy (Be lean) and is supported*

Be clean

- *Communal heating for the dwellings in each apartment block fed from a gas boiler in each*

basement

- *This approach does not facilitate connection of the development to an external district heating network, as site heat network infrastructure would have to be installed at a later date to allow connection.*
- *On-site CHP is not proposed as the lead heat source. The omission of on-site CHP is accepted as the development size is on the cusp of where on-site CHP would be expected*

Be green

- *Solar technologies are proposed to achieve a further reduction in CO2 emissions:*
  - *Solar thermal panels on 20% of the roof area, with local thermal storage.*
  - *300m2 of photovoltaic panels located on 10% of the roof space*

Overall

- *A 25% reduction in regulated CO2 emissions.*
  - *As this application is at the pre-application stage, the 40% reduction target applies to this application*

The applicant's CO2 and whole life cost arguments against a London Plan compliant approach

The applicant's arguments against adopting a London Plan compliant approach are based on a comparison of CO2 emissions and whole life cost (WLC) against an approach which adopts a site heat network. However, the comparison has a number of deficiencies:

- *The level of energy efficiency assumed is inconsistent in the two scenarios:*
  - *A poorer energy efficiency level is assumed for the comparator development.*
    - *This results in higher CO2 emissions and running costs for the comparator after the first level of the energy hierarchy.*
  - *The same high level energy efficiency should have been assumed in order to provide a consistent comparison.*
  - *The London Plan encourages all development's to maximise energy efficiency first.*
- *Adjustments are made to the CO2 emissions and WLC to reflect the developer's view of as built performance due to them perceiving deficiencies in the Building Regulations compliance tools*
  - *The London Plan adopt CLG's Building Regulations compliance tools to allow consistent comparison of schemes*
    - *Any perceived or actual issues with the CLG Building Regulations compliance tools is not a consideration for GLA. If considered significant, this should be pursued with CLG.*
- *Finally, and most importantly, the installation of a site heat network is aimed at providing future access to much greater CO2 savings and waste heat sources, through facilitation of connection to an external district heating network supplying very low carbon heat. These are not accounted for in the analysis.*

Conclusion

Adopting high levels of energy efficiency, which the GLA fully supports, does not provide a justification to avoid installing the site heat network infrastructure required to meet Policy 5.6 of the London and support delivery of the Mayor's Decentralised Energy target.

In the absence of robust evidence to the contrary, as is the case with other developments, the applicant should commit to the site heat network infrastructure fed from a central energy centre to

facilitate future connection to a district heating network.

From: David Blankson-Hemans
Sent: 23 October 2013 18:06
To: Jonathan Williams
Cc: Kizzian Owen; Keith Routledge; Georgia Franco
Subject: RE: 3231 Agar Grove Estate Pre-app
Importance: High

Hi Jonathan,

I have now been instructed to prepare a briefing to present at Sir Eddie Lister's regular consultation meeting on Monday 28 October, to seek a steer a on the acceptability of a PassivHaus energy strategy for this estate renewal, rather than our conventional L.P. approach. The applicant has submitted a supplementary energy report that is too technical in its content to present as a briefing.

Could you please do a short, bullet-point summary of the key features for comparison of the PassivHaus strategy with our normal L.P. approach.
Sir Eddie has previously indicated that he is not too fussed with any strategy, provided it achieves the essential objectives set out in the L.P.

I have entered all the details of this on the energy spreadsheet, but attach a copy of the supplementary energy report for your convenience and look forward to your reply.

Much obliged,
David

From: Jonathan Williams
Sent: 26 September 2013 17:47
To: David Blankson-Hemans
Cc: Kizzian Owen; Keith Routledge; Georgia Franco
Subject: 3231 Agar Grove Estate Pre-app

Hi David,

I've looked through the very limited energy information in the presentation and would comment as follows:

- The applicant has not provided a full energy strategy which follows the format and guidance in the GLA September 2013 Guidance on preparing energy assessments. This remains outstanding together with completed Tables 1 and 2 from the guidance which provide the residual emissions and savings at each stage of the energy hierarchy.

- While the proposals demonstrate an intent to make the development energy efficient by adopting an approach based on the PassivHaus energy standard, based on the information available, it is not possible to validate the 19% regulated CO2 emissions reduction over 2010 Building Regulations claimed through energy efficiency. Modelling sheets should be provided to evidence this level of savings.

- The applicant has highlighted that Kings Cross heat network is south of the

APPENDIX A8 REPORT ON CONTROLLING SUMMERTIME OVERHEATING

9.24 Non-Domestic

Design standards and policy context

Camden policy: CPG3 - Sustainability
The council requires that a full model of the building should be carried out to ensure the building design optimises solar gain and daylight without resulting in overheating for developments comprising 5 dwellings or more or 500sqm or more of any floorspace.
Part L2A
Building regulations part L2A Criterion 3 requires the solar gains to a new build non-residential building to be limited to reduce the need for air-conditioning or to reduce the installed capacity of any air conditioning system installed. Block B includes a number of non-residential units, consisting of community spaces and commercial areas. These units have been modelled using IES and comply with Criterion 3 in part L2A.

The maximum allowable solar gains to any room is the same as an equivalent space having 1m high windows spanning the full length of exposed external facades and being irradiated with an Easterly mean irradiation. As the window size, orientation, lack of shading or g-value of the glass does not result in higher solar gains than this reference case criterion 3 is satisfied.

Solar gain control
There are four main methods of controlling solar gain on buildings generally. These are window size, orientation, glass type and shading.

By reducing window size, less solar radiation can enter a room and therefore the gains are reduced. This comes at the expense of increased daylight and beneficial solar gains during the winter months and can impact the architectural vision.

Orientation of a room can dramatically impact the solar gains. In the Northern hemisphere it is preferable for non-domestic buildings to have large expanses of north facing glazing, with limited direct solar gains and primarily diffuse light, whilst South facing façades have smaller windows to limit direct irradiation into the building and reduce solar gains.

	North	East	South	West	Roof
Mean Irradiation April-September for London area (kWh/m^2)	190	430	510	490	780

Table A8.1 - Mean Irradiation for London Area

Purpose designed glass technology can be installed to limit solar transmittance through the glass. However in limiting the solar transmittance there is also a limit on light transmittance and a tendency towards increased reflectance. There is also a tendency for colouration of the glass (often to a blue/green or bronze colour). As with adjusting the window size, this impacts the daylight and beneficial solar gains during winter months, and impacts the architectural design.

Shading of windows can have a similar impact to reducing window size, reducing the incident radiation. Fixed shading through options such as fritted or obscured sections of glazing, or through fixed window overhangs will not suffer mechanical failures but may reduce beneficial light and heat gains in winter months. Adjustable louvers and awnings allow for shading to be adjusted according to the external conditions but require more maintenance due to the risk of mechanical failure.

A combination of the above methods of control are usually used to limit the solar gains in a building.

Recommendations
Non-residential areas in block B have been analysed for overheating risk from solar gains. The community and commercial spaces of Agar Grove satisfy the requirements of part L2A criterion 3 with the following measures:

- Use of glazing with a maximum g-value of 0.21
- 300mm deep overhang over both ground floor and 1st floor windows to shade glazing on all facades.
- Solid, permanent canopies above the North and South glazing of the Concierge Lobby.

9.25 Domestic

Introduction
It is becoming universally recognised that anthropological climate change is shifting Britain's climate towards hotter summers with higher probabilities of extended summertime heat waves. The design team was aware from an early stage that provisions must be taken to mitigate the risk of overheating; to create thermally comfortable spaces that will continue to operate successfully in future climates. The fact that much of the development hopes to be Passivhaus certified reinforces the requirement for acute attention to detail with respect to overheating, as Passivhaus relies on a highly insulated thermal envelope resulting in the bare minimum heat loss. In the winter, this allows the dwelling to take advantage of Solar Gains for free heating, but in the summer effective strategies to control gain and flush away heat must be considered. The dwellings will be naturally ventilated through external openings in summer without active cooling (complying with Camden CPG3). In the flats most susceptible to overheating detailed analysis using AM10 and IES have been performed to ensure that the dwellings operate within the thermal comfort criteria specified by CIBSE Guide A. Part L, The Greater London Plan and Camden policy have each been analysed to ensure compliance with respect to overheating and have also been used as resources to help inform design strategies.

Design standards and policy context
Planning Compliance - Part L1A
- "Reasonable provisions should be made to limit Solar Gains" Refer to TM37
- "SAP Appendix P should be used to test if Solar Gains are excessive"
- "consideration should be given to the provision of adequate levels of daylighting" refer to BS 8206 - 2

Planning Compliance - GLA: 6.3 Overheating
6.3.1 Development proposals should demonstrate how the design of dwellings will avoid overheating during summer months without reliance on energy intensive mechanical cooling systems. Priority 1 "

Planning Compliance - Camden policy: CPG3 - Sustainability
Camden's policy encourages the use of the following measures to limit overheating:

- Insulation
- Natural Ventilation
- Overshadowing from adjacent buildings
- Room layouts, shallow floor plans and high floor to ceiling heights to aid natural ventilation
- Natural cooling

Agar Grove development design strategies
Agar Grove is a large and diverse development, in the design stage worst case scenarios with respect overheating have been targeted and design strategies have been developed to ensure that the flats in these locations have suitable provisions to avoid summertime overheating. Flats considered in most detail are the single aspect South facing flats in Lulworth House and Plot's A and B. These flats have glazed South facing facades (i.e. the highest solar gain) and are less able to achieve large ventilation rates (as they are single aspect and cannot cross-ventilate). These cases have been modelled in SAP; Dwellings in Plots A and B have also been modelled in depth using IES.

Analysis and conclusions

SAP: A SAP analysis of all the most susceptible flats was performed. All flats passed SAP overheating criteria.

Design Considerations: In SAP a dominant parameter with respect to overheating is the "effective air change rate" (ACH) which refers to the amount of ventilation available for cooling. The ACH value specified in the SAP Calculation and the corresponding area of window opening have informed the façade designs, and been inspected against in all flats.

Integrated Environmental Modelling (IES): Model flats for Plots A and B were constructed in IES. Results showed that without detailed consideration of: Solar Gain control, internal equipment gain and ventilation, overheating is likely to occur. Design strategies to avoid overheating were developed, tested and shown through simulation to be adequate to cool the flats within CIBSE Thermal Comfort Criteria. The London design summer year (DSY) was used in simulations. Proposed strategies have informed the facade design.

Design Considerations:
Solar Gain Control –

> ***% Glazed Area*** **-** Based upon simulations advice was given to the architects to reduce the glazed area of the façade from initial proposals, the highest proportion of glazed area is now 50% with the majority of flats with 30 – 40% glazed facades (this value is in line with recommendations from Passivhaus and TM37).

Solar Shading – On Plot A external balconies have been integrated into the design to control the intense steep angle solar gain into the flats, moveable external shades have also been specified to allow for solar gain control in the summer without forfeiting useful solar gain and daylight in the rest of the year.

Ventilation –

Area of openings to receive sufficient air exchange for cooling – Based upon an initial proportion of 70% glazed façade, opening sizes were recommended to provide a sufficient air flow rate to maintain comfort criteria within the rooms. The glazed area (and therefore solar gain) has since been reduced, though the % opening areas will be maintained with the aim of creating a design that is more robust against hotter future climates.

Restrictions on window opening schedule – An often overlooked parameter are the restrictions placed on the window opening schedule. Freely openable window ventilation, secure ventilation and acoustic ventilation have each been analysed and strategies have been developed. Where necessary in noise sensitive areas acoustic louvres have been investigated to give sound attenuated ventilation in the hottest periods, and likewise with secure louvres/tilt-and-turn windows in areas where security is a concern. However their use needs to be investigated further as part of the passivhaus design development.

Equipment Gain –

Managing Internal Gain – internal gains come from people, lighting and other equipment. Passivhaus utilises this otherwise waste heat for winter heating, though it must be managed in the summer to avoid overheating. Efficient white goods are to be specified, and our analysis has assumed that less hot cooking will take place in high summer. A green concierge is being considered for the development, and would be ideal for advising on reducing internal gains through cooking and using electrical equipment efficiently.

Daylighting

To ensure good daylighting the minimum % glazed area of the façade with no overshading Is approximately 30%, this results in a high level of natural light whilst avoiding overheating. Note this is highly dependent on shading and overshading. Daylight advice has been provided by Anstey Horne and daylight results can be found in the daylight report.

Achieving summer comfort in the future climate

Preliminary modelling has been performed using the 66th percentile Medium emissions scenario, PROMETHEUS design summer year for Islington, and overheating has been tested against the recently published TM52 adaptive response overheating criteria. It lists the following criteria, which all must be fulfilled for compliance:

1. Hours of exceedance
2. Daily Weighted exceedance
3. Upper Limit Temperature.

This criteria is reasonable for Living Rooms though does not take into account the more rigorous comfort criteria required in Bedrooms. Below is an indicative summary of the modelling results

Living Rooms:

Based on current designs if windows can be open during occupied hours the rooms do not overheat. When acoustic restrictions are placed on the window opening schedule then the rooms begin to overheat, as the flow through an acoustic louvre cannot satisfy the increased flow rate associated with the higher summer cooling load in future climates. In this scenario in the height of summer to maintain thermal comfort the occupant would have to rely on an acoustically compromised air supply. Another possible response to this would be retrofitting external shading to manage solar gains.

Bedrooms:

There is currently not an appropriate criterion to test Bedrooms in the future climate. We propose a modified standard based on TM52, adapted to account for the reduced comfort temperature during the night-time. The design will continue to be tested against this during the next design phase.

APPENDIX A9 FEASIBILITY ASSESSMENT OF CONNECTION TO KINGS CROSS CENTRAL DISTRICT HEATING

Design Considerations

- The new Agar Grove Estate lies around 400m directly North West of the new Kings Cross Central development
- Between the two developments lie a developed area of light industry, London Overground rail lines, First Capital Connect Thameslink rail lines, Southeastern High Speed rail lines and the proposed HS2 rail route.
- The most direct roads linking the two sites, and therefore possible future network routes, are Camley Street or York Way/Agar Grove. These both would result in 1km routes of pipework.
- Camley Street passes beneath the Southeastern High Speed Railway and First Capital Connect Thameslink. Camley Street also passes over The Grand Union Canal and beneath London Overground Railway.
- An estimated connection cost to Kings Cross Central is £1.4m. This includes energy centre base build construction, infrastructure, back up boilers, thermal stores, substation and 1km connection from Argent site to Maiden Lane.
- York Way is also known as the A5200 and is a major road running North from Kings Cross St Pancras to the A503. York Way runs beneath London Overground Railway, the proposed HS2 route and Southeastern High Speed Rail. Agar Grove passes over First Capital Connect Thameslink before reaching the Agar Grove Estate.

Legal and Management Considerations

- Should connection be made to Kings Cross Central, all residents would be purchasing their energy from an Energy Service Company (ESCO). As a private company Argent would not be governed by the Utilities Act and therefore the service would not be competitively tendered. Residents would be limited to a single supplier and unable to change should cost or service be unacceptable. Residents have also expressed strong objections to a central heat supply.
- Connection would mean a 3rd party negotiation which creates uncertainty and risk
- The use of CHP on the Kings Cross Central site would not result in any electricity offsets for the residents at Agar Grove as all generated electricity would be retained by Kings Cross Central.
- The Kings Cross site is currently under construction with a phasing strategy already in place. Should Agar Grove be connected to Kings Cross Central the phasing of central plant installation may need to be adjusted for the increased load.

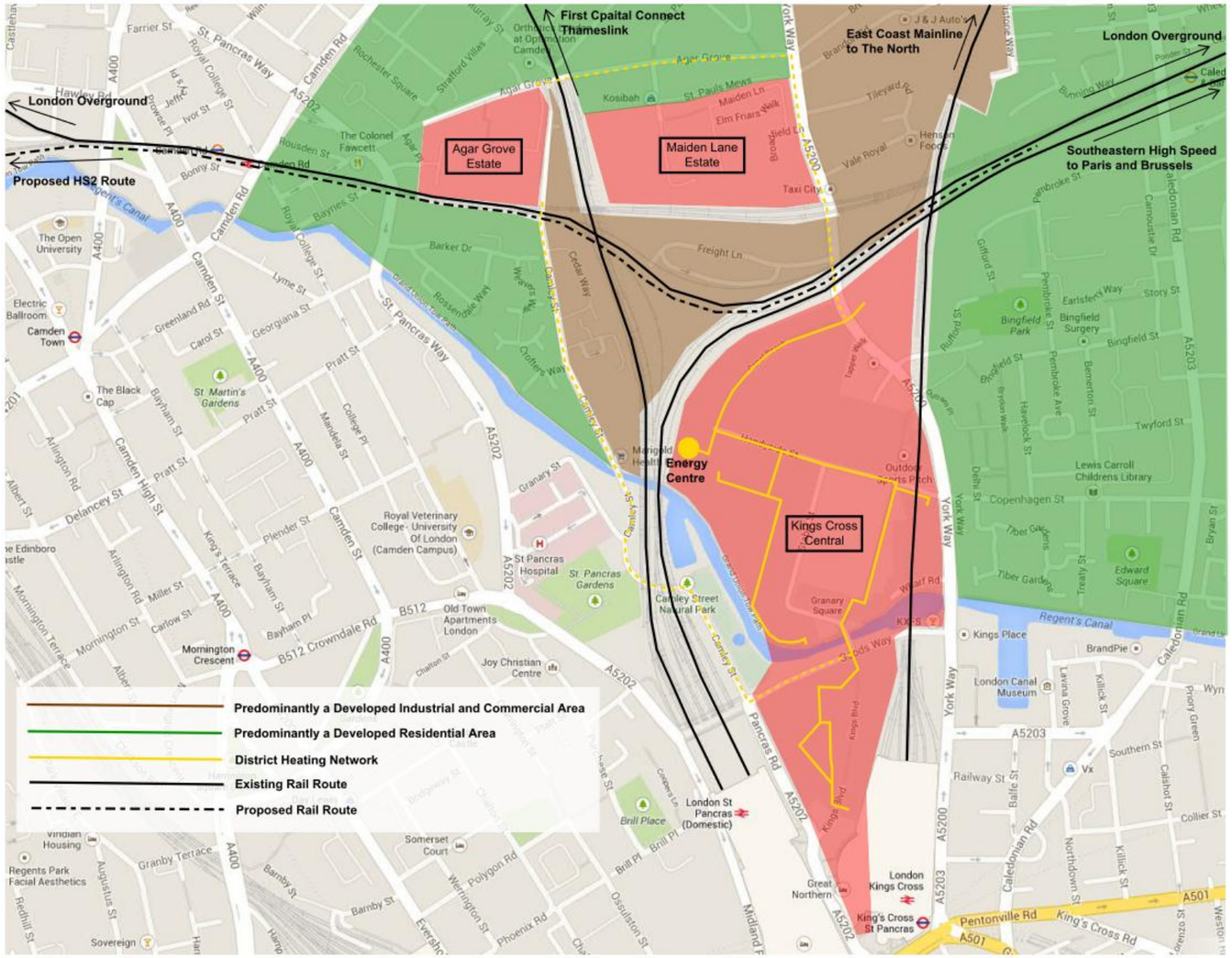

Figure A9.1 - Agar Grove Energy Strategy: Connection to Kings Cross Central

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