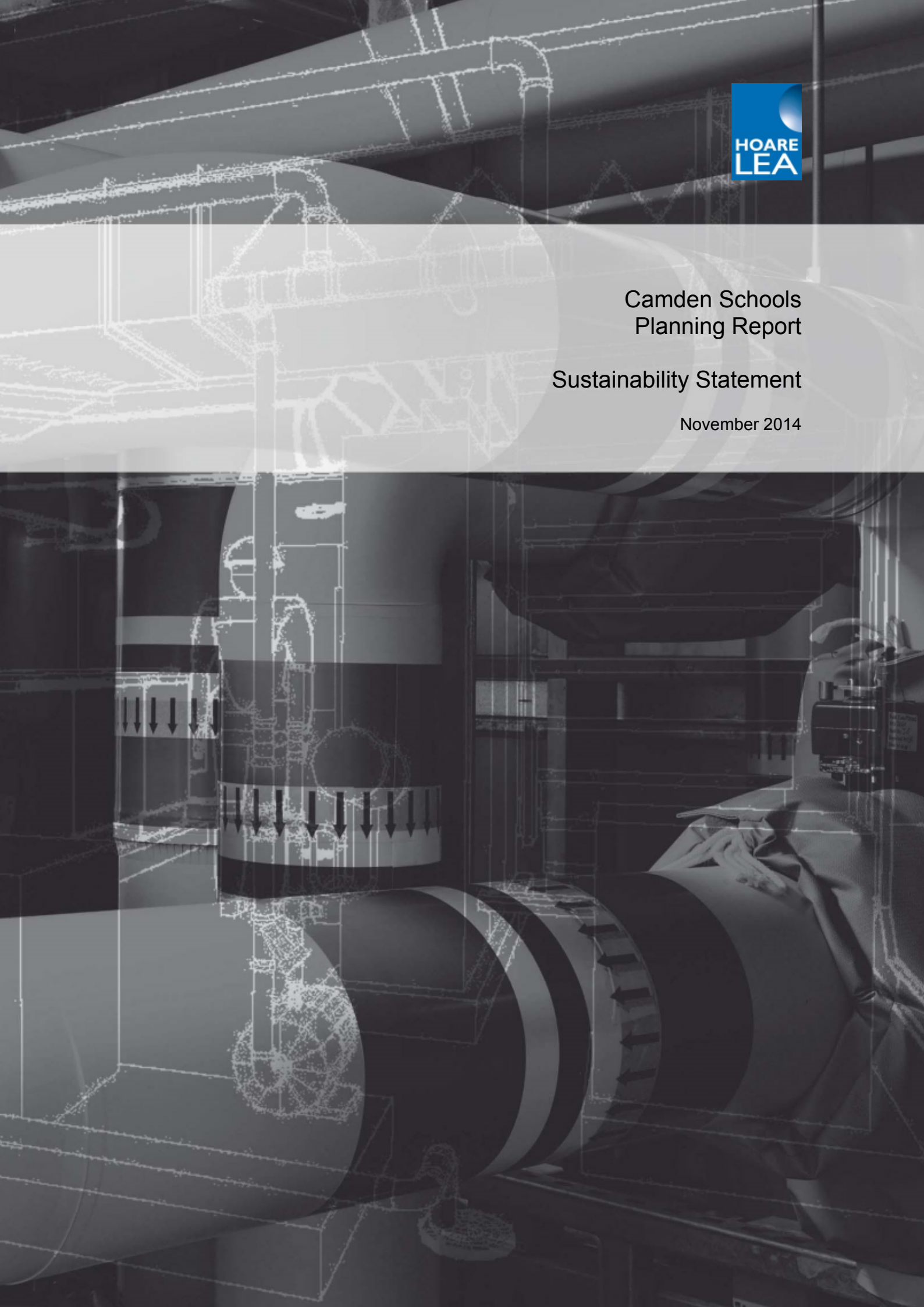


Camden Schools Planning Report

Sustainability Statement

November 2014

ISSUE STATUS

Rev.	Description	Prepared and checked by	Reviewed by	Date
draft	Issued For Comment	TC		26/11/14
P1	Issued For Planning	TC	MC	01/12/14
P2	Revised For Architects Comment	TC	MC	03/12/14

Introduction

The Camden Schools development comprises of the refurbishment and extension to both the existing William Ellis and Parliament Hill Schools, along with a new-build La Swap sixth form. The Ribbon Building is a large new-build extension to the Parliament Hill School, which will be designed to achieve the Passivhaus standard for exceeding thermal comfort and energy efficiency. The development is located adjacent to Hampstead Heath off of Highgate Road, Camden, London.

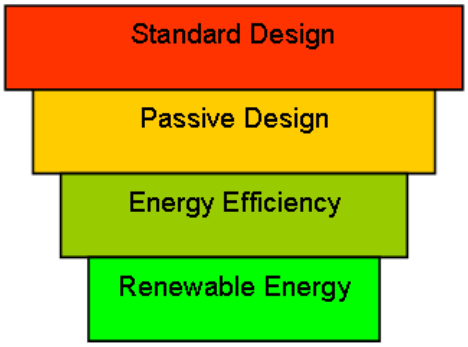
This document reviews the design approach and subsequent sustainability credentials of the project in line with the Camden Planning Guidance 3 (Sustainability) and London Plan 2011 document. This document will also address the following Local Development Framework (LDF) policies – Tackling climate change through promoting higher environmental standards (CS13), Promoting sustainable design and construction (DP22) and Water (DP23).

Camden Council is committed to reducing Camden's carbon emissions and a big driver is to implement sustainability guidance for large scale construction projects. Buildings in Camden account for 88% of Camden's overall carbon dioxide emissions, resulting from their energy usage.

Energy Statement

To design a truly low-carbon building, the most effective approach to reducing operational energy use (and therefore carbon emissions) is to reduce the building's energy demand before then reducing its consumption. This is done by first utilising passive design measures on the building fabric ('Be lean'), before then specifying efficient systems ('Be clean') and low and zero carbon (LZC) technologies ('Be green').

This principal to efficient design can be considered as an 'energy hierarchy' as illustrated in the figure below. The inverted pyramid highlights firstly the energy consumption from a standard design. Passive design techniques should be considered firstly to minimise energy consumption, which also has other benefits such as smaller plant requirements. Then by using efficient plant and equipment, energy consumption can be further reduced. Once the energy demand overall has been minimised, then low and zero carbon technologies in the form of renewable energy can be integrated into the design to provide the remaining energy via sustainable low carbon means.



Roadmap to Efficient Design

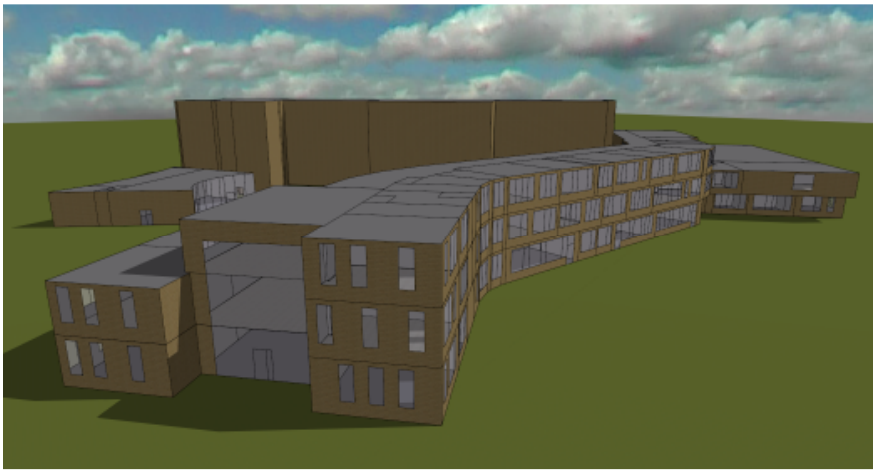
Reduce the demand for energy – Be Lean

Reducing a building's energy demand requires the use of passive measures predominantly in the design of the fabric. The following has been considered in the baseline design for the proposed new-build elements of Camden Schools:

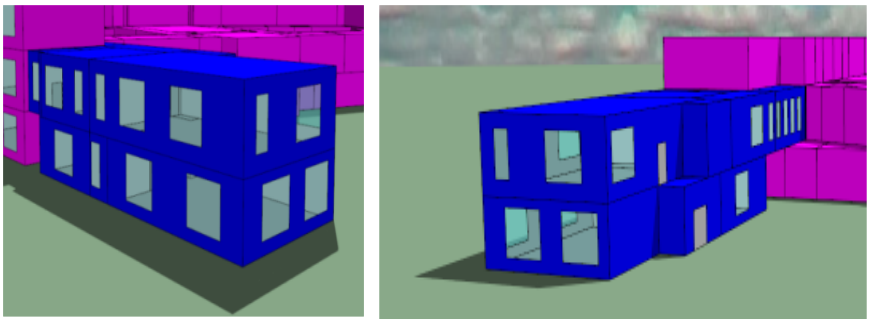
- Building form and orientation
- Passive ventilation strategy (utilisation of effective natural ventilation where possible)
- Minimising air leakage
- Exposing thermal mass (to benefit natural cooling)
- High efficiency glazing
- External shading (to benefit natural cooling)
- High performance insulation

The glazing is perhaps the aspect of building design that requires the greatest compromise in order to reduce heat loss in the winter and heat gain in the summer, whilst providing sufficient openings to promote natural ventilation and adequate daylight to the interior spaces throughout the year. Thermal modelling is a tool that enables a design team to complete an iterative exercise to achieve the optimum compromise between these four criteria. Specifying glazing with a low G-value (solar energy transmittance) will also reduce the direct solar radiation entering the rooms, which will support the aspiration to utilise natural ventilation in as many of the occupied areas as possible.

For the proposed Camden Schools development a full thermal model for the new-build element of each building has been carried out; the results of which are fully described within the associated Part L reports and energy statements. Some images from the models are shown below:



Parliament Hill School Ribbon Building and Dining Block IES Model



William Ellis School Extension IES Model

La Swap Sixth Form IES Model

Using this model we have evaluated the passive design measures that can be incorporated. The pertinent results of this for Camden Schools are:

- Mechanical ventilation with heat recovery has been assisted by natural ventilation where possible
- BB101 overheating and BREEAM/CIBSE daylighting design criteria's exceeded
- The buildings fabric has been improved in excess of the current Building Regulation Part L requirements and for the Ribbon Building in accordance to the Passivhaus 'Gold' standard
- BREEAM 'Excellent' achieved for the Parliament Hill School and La Swap buildings

Supply energy efficiently – Be Clean

Once passive design measures have been exhausted, the remaining energy demand should be utilised efficiently which is achieved primarily through active design. Occupancy & daylight sensors on lighting systems and heat recovery on the mechanical ventilation systems are good examples of energy efficient active design measures that can be incorporated on the mechanical and electrical systems of a building.

Ensuring good controllability and zoning of all systems can also significantly improve the operational efficiency of a building. Various areas of the building that are likely to have different occupancy profiles should be designed to enable the user to heat solely the occupied areas, therefore reducing wasted energy.

The electrical consumption of the lighting is typically a large percentage of any building's regulated operational energy use. It is important to consider the specification of luminaires and control strategy to reduce the operational energy use of this system.

For the Camden Schools development we have incorporated the following where practical:

- Energy monitoring and controls dialogs
- Lighting controls & integration of natural daylight
- Variable speed pumps & fans
- Heat recovery on Air Handling Units (AHU)
- High efficiency boiler plant
- Combined Heat & Power (CHP)

The energy efficiency of the existing retained buildings in Parliament Hill School and William Ellis School will also be addressed.

Parliament Hill School will receive new energy efficient boiler plant replacing the old and in-efficient heating system as well as new lighting and lighting controls throughout the building in those areas that have not recently been refurbished. The lighting and heating accounts for a large proportion of the regulated loads in a school building and so this impact of this is significant.

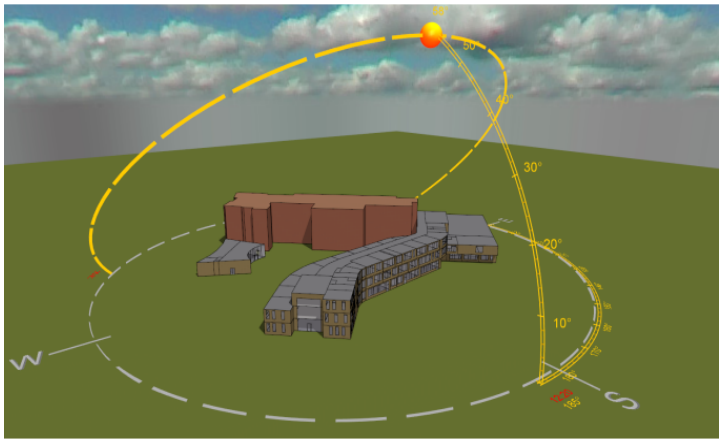
William Ellis School has recently had its boiler plant replaced and so replacing this again will not offer much carbon reduction. However, much of the existing lighting installation is aged and so the lighting will be replaced with new control systems in the existing building.

Use renewable energy – Be Green

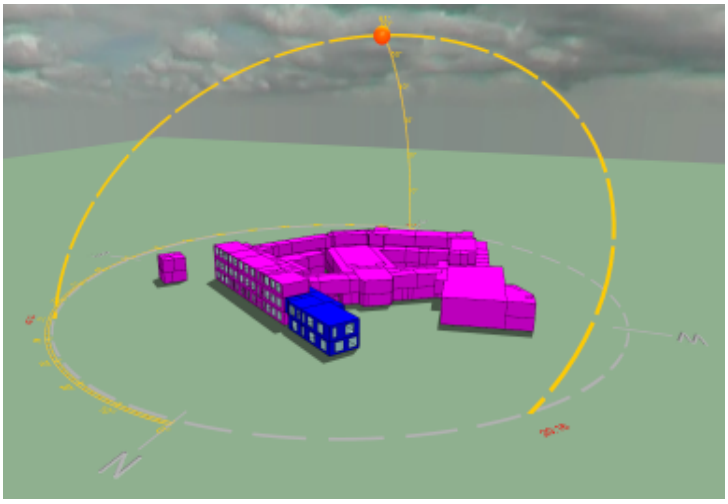
Once all passive and active design measures have been reviewed, a more accurate energy and load profile can be created for a building enabling plant to be suitably sized and specified. Low and Zero Carbon (LZC) technologies can then be assessed for their suitability for any given development. However, an assessment of the lifecycle energy, cost and carbon emissions of each system should be carried out in order to select the most appropriate solution for the development. A requirement has been set by Camden Council for a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies. With assistance from the high performance of the passive design, this target for the site is exceeded beyond the Building Regulations Part L building emission rate (BER).

A LZC technologies assessment has been carried out for each building and the results of which are summarised below.

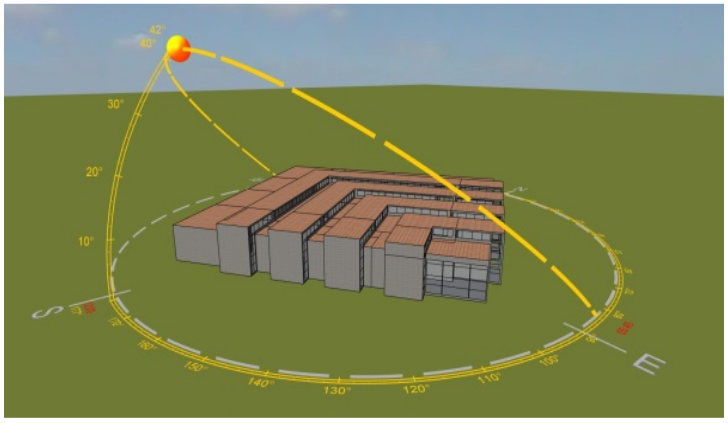
The images below show the thermal model of each building, which has been used to assess various passive & active measures, and LZC technology on the regulated energy consumption (and resulting CO_2 emissions) of each building.



Parliament Hill School IES Model



William Ellis School IES Model



La Swap Sixth Form IES Model

The conclusions of the reports are summarised as follows:

- Solar photovoltaic panels have been identified as the most appropriate technology for the scheme to achieve good energy and carbon reductions. The design of the new and existing roofs offers the optimal orientation and incline for the maximum panel output.

- Air source heat pumps (ASHP) are not recommended. Whilst technically feasible, the heat load of the building is predicted to be relatively high, therefore the amount of heat pumps required and total air flow rate will be exceptionally large. This will require a substantial amount of roof/adjoining space, and incur a significant noise disturbance that would require attenuation.

- Due to various site restrictions, hydro, tidal, wave and wind power have all been deemed not suitable for the development.

- Although the non-seasonal heating load (domestic hot water) of the buildings are expected to be relatively low, a suitably sized CHP engine will provide enough carbon emission reduction to make it a feasible low carbon technology to consider. This will be included in the new Parliament Hill School central plant room, sized for the domestic hot water demand of the new changing rooms and toilets.

- There is no district heating network within close proximity to the site to connect to.

- Biomass/Biofuel boilers are not recommended because of storage requirements and the increased risk with regard to fuel availability.

LZC Technology	Suitability
Ground Source Heat Pumps	Only in absence of CHP
Air Source Heat Pumps	Not suitable
Combined Heat & Power (CHP)	Recommended
Biomass Boilers	Not suitable
Biofuel Boilers	Not suitable
Community/District Heating	Not suitable at this time
Solar Photovoltaic (PV) Panels	Recommended
Solar Thermal heating Panels	Only in absence of CHP
Wind Turbines	Not suitable
Hydro/Tidal/Wave Power	Not suitable
Water Source Heat Pumps	Not suitable

Solar thermal panels typically have payback periods in excess of 10 years (inclusive of RHI income) whereas CHP plant can pay back within 5-10 years if there is a simultaneous heat and power requirement for over 4500 hours per year. The CHP plant at Parliament Hill School has been sized to meet these criteria, otherwise known as the 'heating baseload' for the building.

The Feed-in Tariff rate has been calculated with an aim of ensuring PV panels have a return on investment (ROI) of 8% giving a payback of around 12 years. As the capital cost of PV panels decrease, the FIT rates decrease to maintain this ROI.

Therefore the scheme incorporates PV and CHP. Further information from the Part L reports and energy statements for each building has been included within the ‘Summary’ section below.

BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

A BREEAM Pre-assessment has been completed on the Parliament Hills School and La Swap buildings and an 'Excellent' rating is targeted in line with the planning requirements for this project. The schemes have been registered under the 2011 BREEAM New Construction assessment methodology (registration numbers BREEAM-0052-3498 for PHS and BREEAM-0052-3506 for La Swap). The William Ellis School development has not been considered for BREEAM assessment due to the new-build extension being less than 500m² and 25% of the overall building floor area.

Ribbon Building and the Passivhaus Standard

Passivhaus is the most advanced building energy standard in the world, which can result in a 90% reduction in energy demand and usage. Created in Germany in 1990 and originally applied to domestic buildings, it has been applied to more than 20,000 buildings. The two main principles of Passivhaus are to reduce heating and cooling demand as much as practically possible and to seek to reduce all energy uses. Two important associated advantages over a 'Part L only' approach are that a Passivhaus analysis leads to an assessment of estimated energy consumption in kWh/m²/yr (not only in terms of percentage improvement over a virtual 'notional building') and that contrary to Part L, it captures all energy uses in the building and does not exclude 'unregulated' energy uses, e.g. ICT, equipment.

The Ribbon Building will achieve a 'Gold' energy efficiency standard, which will result in lower energy bills for the school, along with better air quality and comfort through improved quality of design and construction. The building fabric (walls, roofs and floors) will be super-insulated and the windows will be triple glazed. A high air tightness will reduce the heat losses and gains substantially. Energy efficient building services and teaching equipment will further reduce the energy requirements. The key requirements for Passivhaus certification have been assessed at this stage to ensure that the Ribbon Building design complies.

Summary

The following table summarises the sustainability credentials of each of the Camden Schools buildings:

	Parliament Hill School	**William Ellis School**	**La Swap Sixth Form**
BREEAM	'Excellent' rating exceeded with a baseline score of 75.11% (5.11% over excellent requirement)	Not feasible for the small area of new-build extension (less than 500m² or 25% of the total building area)	'Excellent' rating exceeded with a baseline score of 78.67% (8.67% over excellent requirement)
Part L	Exceeds Part L2A 2013 with a 35% carbon reduction beyond the Target Emission Rate (TER)	Meets Part L2B 2013	Exceeds Part L2A 2013 with a 42% carbon reduction beyond the Target Emission Rate (TER)
Building Emission Rate (BER)	Ribbon Building 10.6 $kgCO_2/m^2$.annum Dining Block 19.9 $kgCO_2/m^2$.annum	Not required for Part L2B 2013	12.0 $kgCO_2/m^2$.annum
Camden Council Target	Exceeds 40% CO_2 reduction over Part L2A 2006	Not applicable (less than 500m²)	Exceeds 40% CO_2 reduction over Part L2A 2006
London Plan 2011	Exceeds target of 35% emission reduction over Part L 2010	Not applicable (less than 500m²)	Exceeds target of 35% emission reduction over Part L 2010
LZC Technologies	**Photovoltaics**[1] 33,340kWh/yr ~ 300m² **CHP** $30kW_{thermal}$ $15kW_{electrical}$	Not applicable (less than 500m²)	**Photovoltaics**[1] 6,300kWh/yr ~ 55m²
LZC Carbon Reduction	Contribution exceeds 20% of the BER carbon emissions	Not applicable (less than 500m²)	Contribution exceeds 20% of the BER carbon emissions
Passivhaus Standard	'Gold' standard achieved for Ribbon Building only	Not applicable	Not applicable
Overheating Analysis	Exceeds BB101 criteria	Exceeds BB101 criteria	Exceeds BB101 criteria
Daylighting	Meets BREEAM criteria	Meets CIBSE criteria	Meets BREEAM criteria

[1] The photovoltaic (PV) area is dependent on the specification of the PV panels as there is a substantial difference in efficiency, output and area between different PV manufacturers hence these figures are provided for guidance only. The location of PV array for the whole development will be agreed with the architect in accordance with the planning application (for example there will be no PV on the roof of the new La Swap building and this will be included elsewhere on the development).

Biodiversity and Landscaping

The landscape has been designed to support and foster biodiversity and seeks to anchor this development into the local green grid acting as a continuation of the adjacent heath.

The planting scheme is rich in native species, taking strong inspiration from the heathland landscape both in terms of species and structure. The proposed tree species are all of native origin and are species found in the local heathland landscape, species such as; Quercus robur, Alnus glutinosa, and Betula pendula.

A heath inspired meadow mix will be implemented around the periphery of the site and will include species such as; Chrysanthemum vulgare, Primula veris, and Sucissa praetensis.

The green roof system will include vegetation chosen to replicate the heath and support the local flora and fauna including species similar to those at ground level; Chrysanthemum vulgare, Primula veris, Daucus carota, Plantago lanceolat, and Achillea millefolium. The biodiverse wildflower mix will make up 75% of the area with the further 25% as sedum.

The proposed green walls will be a low maintenance fixed cable system. There will be a mix of deciduous and hardy evergreen climbing species to offer seasonal interest such as; Lonicera pericylemenum 'Graham Thomas', Humulus lupulus 'Aureus', Parthenocissus henryana.

The species chosen and character of the planting scheme ensure a robust, low maintenance scheme that provides plants for pollinators and fruiting trees and shrubs to support various species of wildlife whilst maintaining a naturalistic aesthetic.

Bat and bird boxes will be included in the landscape wherever suitable. Typically existing mature trees will be the best locations as the height and dense canopy will provide suitable shelter for roosts. The roosting areas allocated for bats will be located a suitable distance from the lighting on site - most notably the area adjacent to the Games Courts Area in Parliament Hill as at times this area will be flood-lit. The bat survey identified that there is limited commuting and foraging activity across the site; by Common and Soprano Pipistrelle bats.

Wildlife foraging activity was mainly confined to the boundaries of the site and around trees in the central area. The trees surveyed were found to have no visual cavities or other suitable roosting opportunities for bats and were classified Category 3.

Any loss of potential roost sites can easily be replaced and enhanced through the erection of new bat boxes in retained trees. There will also be only a slight negative impact on foraging across the site through the loss of some trees required for the new construction. Boundary features will stay intact and new shrubs planting and landscaping with native species suitable to support foraging insects as a food source for bats and birds can mitigate the loss of the current low value resource.

Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. Boxes will be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round.

Stag beetles were not recorded during the survey, as they spend the majority of their life span (3-5 years) as grub and typically emerge above ground as adults typically around June/July. In order to protect the existing Stag Beetle Grub on site where existing trees in shrub areas are felled the stump of the tree should be kept as the grub feed on the deadwood and the root structure below ground. The existing log piles on site should be kept wherever possible also. The proposed logs and log piles (in the habitat area) will make use of the wood from the felled trees across the site and will provide additional food sources for the Stag Beetle Grub.

Adaptation to the impacts of climate change

The phenomenon of climate change is a global problem, affecting both existing buildings, new developments and all aspects of life on earth. Due to the complex nature of climatology, it is difficult to predict the exact course that the global climate will take, although there are a number of key trends, for example rising global temperatures, which are generally agreed upon.

There are two key approaches that can be taken with regards to climate change:

1. Steps can be taken to mitigate the factors which lead to increased climate change.
2. Measures can be implemented to ensure that buildings are resilient enough to cope with the changing climate.

Usually, a combination of these two approaches is adopted; offering the best compromise between effectiveness and required investment. This section discusses the site's ability to adapt to the predicted effects of climate change and to be designed to be resilient to them.

Key Conditions for Climate Change Adaptations

In order to reflect the likely predicted changes in climate, four key primary effects have been identified for consideration when designing for Climate Change Adaptation.

The four key conditions are as follows:

- Hot Summers
- Extreme Snow and Ice
- Floods
- High Winds

In order to evaluate the proposed Camden Schools development site, each of the four conditions will be considered in turn, with the positive and negative features of the site investigated.

Hot Summers

Research has established that the likely average temperature increase by the end of the century will be 4.5ºC, based on the current emissions trajectory; along with a pronounced warming effect in summer, leading to temperatures regularly reaching above 40ºC in the UK.

Within the modelling carried out on Camden Schools the effect of overheating has been studied in-line with the BB101 overheating criteria for schools. There is margin within the natural ventilation system to accommodate increased external temperatures against current design standards.

Extreme Snow and Ice

Along with a predicted increase in average annual summer temperatures, Climate Change is also predicted to lead to an increased frequency of extreme snow and ice conditions.

The Camden Schools development includes additional capacity on the gas supply to allow the boiler capacity to be increased in the future as required. In addition the structure includes for the requirements of future snow loading.

Floods

It is predicted that by the 2080's the predicted level of precipitation during winter could increase by as much as 45%, under a high emissions scenario. Conversely, for the summer conditions it can be seen that the seasonal precipitate could reduce by as much as 45%, based on a high emissions scenario. With such an increase in the level of seasonal precipitation in winter, the likelihood of flooding also increases.

The site is located within Flood Zone 1 (lowest risk of fluvial flooding) with little chance of other sources of flood risk. The site area is approximately 0.8ha, therefore it falls under the 1ha threshold that would necessitate a site specific flood risk assessment to appraise surface water impacts in Zone 1.

Surface water run-off will be managed using source control methods designed in accordance with CIRIA Report C697 'The SuDs Manual' and utilising the infiltration rates set out in the Ground Investigation Report. Drainage pipes will collect flows from rainwater down pipes around the perimeter of the buildings and from impermeable areas of paving.

Permeable paved areas will be designed to accommodate rainwater runoff generated by the critical duration 1 in 100 year (+20% climate change allowance) storm event.

High Winds

It is believed that Climate Change will lead to an increased frequency of the occurrence of extreme weather conditions; a factor which also applies to wind speeds. With a predicted increase in global temperatures, it is thought that this factor contributes to an increased occurrence of high winds.

The structure will be designed to safely withstand wind forces in accordance with the latest UK guidance which consists of a National Annex to the Eurocode. This includes allowances for extreme events and climate change. In addition the low rise buildings within the site are well protected by adjacent trees and buildings.

Use sustainable building methods and materials

The project has a high level of sustainable aspirations. As such the scheme targets:

- All materials used will have a high percentage of recycled content where possible.
- The embodied carbon content of all materials will be evaluated in the material selection and high carbon embodied materials will be avoided if possible.
- Any timber used will be responsibly sourced.
- Where possible off site manufacturer methods will be used for building and M&E elements to reduce the waste and increase the quality.
- Use local suppliers and labour where possible to reduce the carbon used in transport.

When the contractor is appointed the building methodology will be developed further to exploit the expertise of the contractor using their experience.

Recycle construction waste

Where possible the waste produced by the construction of the Camden Schools development will be reduced where possible by careful planning of construction materials, off site manufacturing methods where appropriate and minimising or reusing the packaging for deliveries to site.

Of the remaining construction waste, it will be recycled where practically possible having regard to relevant contractors recycling regimes.

A contractor is yet to be appointed for the scheme and so a final construction waste management plan cannot be fully developed, but when a contractor is appointed this will be formalised.

In addition it is a contract requirement that the contractor adheres to BREEAM WST 01 – construction waste management. They must put a plan in place to meet the BREEAM requirements as a minimum.

Incorporate water conservation measures

Water conservation is key to the scheme to minimise the impact of the building on the build environment. The proposed Camden Schools includes:

- Low flow water fittings on sinks, wash hand basins and showers.
- Dual flush low volume WC's.

Conclusion

The proposed scheme has been designed with sustainability and energy efficiency at the heart of the concept.

The scheme has been developed using the energy hierarchy and passive design measures enabling the applicant to achieve the high carbon reduction targets stated.

This is demonstrated through the BREEAM and Passivhaus standards that have been committed to.

The scheme meets the planning guidance for carbon reduction as demonstrated in the summary table.

The scheme also incorporates carbon reduction works to the existing buildings demonstrating the applicant's commitment to total carbon reduction on the site.

Holistic sustainability has also been addressed in the design incorporating construction, biodiversity, water use and the social/economic benefits.

Holistic sustainability has also been addressed in the design demonstrated through commitment to reducing the total impact of a development on the environment and community. The applicant has addressed reducing in use carbon, reducing water usage, built using sustainable materials, adaptable to future climate change and provide a positive contribution to the community.