15a & 37 Camden High St.

Sustainability Support Statement for the Proposed Mixed Residential and Commercial Re-Development at 15a & 37 Camden High St.

Oberon Properties Ltd.

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EXECUTIVE SUMMARY

The following Sustainability Support Statement has been prepared to support the planning application for the proposed mixed redevelopment at 15a & 37 Camden High St. The support document has been prepared in accordance with the requirements contained in relevant guidance documentation, as listed below:

- *SD9 - Resources and Energy*, Camden UDP;
- *Policy B1 - General design principles,* Camden UDP;
- Appendix D, *Sustainable Design and Construction,* London Plan Supplementary Planning Guidance

A summary of the overall estimated energy demand, energy savings from energy efficiency measures and use of renewable energy technology options and the associated reduction in carbon dioxide emissions is presented below:

Estimated Energy Demand:

	MWh	**Carbon Dioxide emissions kg/annum)**
Baseline case	245[1]	65,200
Savings from energy efficiency	11	3,200
Renewables/low carbon energy generation and CO_2savings	47	4,500

The proposed renewable/low carbon technologies are solar thermal hot water heating panels (5MWh) and a ground source heat pump (vertical, closed loop system, 42MWh) heating system. Both systems will be supplemented by a gas fired condensing boiler heating/hot water system with a SEDBUK rating of band B or above.

It is proposed to install 220m^2 of green roof to reduce the environmental impacts of the development associated with the storm water discharge rate, the urban heat island effect, local air quality and the energy performance of the building.

Rainwater harvesting will be used to provide the equivalent annual non-potable water requirements of the equivalent of two residents.

[1] Assumes full occupancy of flats at 12 residents

1. Energy Demand Assessment

The initial estimation of the energy demand of the development is based on guidance in CIBSE Guide F: 2004. The estimated energy demand and breakdown for the three number two bedroom flats (gross floor area 245m^2) and commercial office space (gross floor area 1280m^2) is set out below:

Total energy efficiency savings versus baseline scheme (annual data)

	Baseline scheme		Proposed scheme		Change	
	kWh	**kg/CO_2**	**kWh**	**kg/CO_2**	**kWh**	**kg/CO_2**
Electricity	78,000	32,800	74,000	31,100	4,000	1,700
Heating/Hot water	167,000	32,400	159,500	30,800	7,500	1,600
Cooling	0	0	0	0	0	0
TOTAL	245,000	65,200	233,500	61,900	11,500	3,300

Annual energy efficiency savings summary:

	Amount	**%**
Reduction in energy demand	11,500kWh	5
Reduction in CO_2 emissions	3,300 kg/CO_2	5

Renewable energy savings summary (energy efficient scheme basis):

	Amount	**%**
Proposed CO_2 reduction from renewables	4,500 kg/CO_2	7.3
Proposed energy generation from renewable/low carbon sources	47,000 kWh	20.2

2. Energy Efficient Design

The development takes into account the London Plan Policy in relation to Sustainable Design. The design and construction of the building fabric will meet with the requirements of the Part L Building Regulations. The proposed construction materials have taken their precedence from the existing surrounding buildings, which include render and glass.

The guidance published in the *Code for Sustainable Homes (Department for Communities and Local Government)* has been used in developing the energy efficiency measures for the proposed development.

The guiding principles behind the design of the building and energy use are based on those endorsed by the London Plan i.e.

i. Use less energy (Be lean);
ii. Use renewable energy (Be green);
iii. Supply energy efficiently (Be clean)

Architectural and building fabric measures specific to the scheme that address the above issues will include:

- combination of existing brick with zinc metal cladding on the extensions, to fit in with adjacent buildings;
- high standard of insulation to environmental thickness standards required by BS 5422, to minimise internal heat losses and reduce solar loading in summer;
- use of high thermal mass construction materials to even out thermal loads/reduce energy demands;
- a target building envelope design performance Heat Loss Parameter (HLP) of <1.3 $W/m^2 K$;
- double glazed windows, tilt/turn, to provide good thermal and acoustic properties and low maintenance;
- window glazing to comply with a minimum BFRC window energy rating of C;
- recessed windows to provide shading from solar gain on the south facing windows;
- size of south facing windows reduced to minimise solar gain;
- windows on north facing side reduced to minimise heat loss;
- use of a green roof to reduce the storm water discharge rate, increase the thermal insulation properties of the roof and reduce the impact of the urban heat island.

All electrical devices, fittings and appliances to be fitted in the commercial and residential units will adhere to the following guidelines:

- internal lighting: all fittings installed only able to use energy efficient lighting devices;
- selection of fit for purpose energy efficient domestic appliances and fixtures;
- use of eco-labelled white goods, where provided, to have an A+ rating under EU Energy Efficiency Labelling Scheme;

- use of timer switches, presence detectors, daylight sensors, to control communal areas with internal lighting;
- external lighting: all space lighting provided by dedicated energy efficient fittings; security lighting fitted with movement detectors and daylight shut-off sensors;
- use of daylight and natural 'borrowed' light techniques; glazing, light tubes, light wells etc. for internal spaces to reduce the overall electrical loading;

In terms of the lighting, which forms the majority of the electrical demand, the intention is to assess accurately the artificial lighting requirements and design systems needed to achieve the optimum, minimum lighting levels necessary for safe working. In parallel with this design process due consideration will be made as to the choice of wall, floor and ceiling finishes, to improve the reflectance values, which will also reduce the lighting requirements.

The design of energy efficient systems will include both total building metering and sub-metering systems, to ensure that future building performance can be continually monitored by the building operator. Routine analysis of the collected data will identify poorly performing parts of the building and enable investigation/corrective actions to be taken.

It is estimated that an improvement of up to 5% of the overall electrical and heating demands of the building could be achieved by applying the enhanced systems and equipment outlined above.

3. Heating and Cooling Systems

The design of the building fabric will minimise the heating demand by the use of appropriate construction and insulation materials and reduce the need for cooling by minimising solar gain during the summer months. Measures to be applied are indicated in section 2 above and include factors such as the use of thermal buffers in areas of potentially high heat loss, such as vestibules, atriums, conservatories, garages, lobbies and sheltered courtyards; use of thermal massing; use of shading and insulation to improve passive solar effects.

The detailed design of the building services has not yet been completed. The basis of the current energy assessment is therefore based on a conventional 'centralised' system for heating/hot water services.

The overall design philosophy of the development requires only heating systems, with no requirement for cooling. The design approach is based on using a tiered layer of control elements that allow optimal use of energy to meet the user requirements, while at the same time maximising the efficient use of energy. Each control layer interacts with the previous, to ensure that while sufficient energy is made available, its distribution and use is controlled within set design limits to avoid wastage. The provision of controls is crucial in achieving satisfactory in-use efficiencies.

The design approach to building services is based on the following criteria:

- clear definition of user requirements;
- identification of the most efficient equipment to achieve the user requirements;
- centralised intelligent controls;
- localised i.e. user, controls.

Based on a centralised heating/hot water system, at the design stage considerations to be taken into account to ensure the most efficient use of energy will include:-

- specification of energy efficient plant, e.g. condensing boilers;
- accurate plant design and equipment selection: correct location and position of plant rooms minimises the length of pipework and influences the heat losses and running costs of the distribution system.
- accurate system design and testing, minimising losses: correctly sized distribution systems reduce pump/fan energy consumption;
- consideration of 'passive' heating, ventilation and in particular, cooling techniques where possible;
- consideration of mechanical ventilation with heat recovery where passive systems are not possible;
- consideration of the use of supplementary 'renewable' forms of energy where feasible and practical;
- consideration of de-centralised plant and energy systems to be included wherever feasible and shown to be more sustainable in energy and carbon terms.

Use will be made of natural ventilation for common access areas and corridors. The passive heating effect induced in the stairwells will aid the natural movement of air through the building. Localised mechanical ventilation will be provided for bathroom and kitchen areas.

Once the above characteristics have been optimised, further energy efficiency benefits will be gained through the use of centralised intelligent controls. Typical measures to be incorporated will include:-

- compensated heating;
- optimal start/stop and set back of heating systems;
- comprehensive monitoring and control of systems status and alarms via a building management system;
- time clock control of zoned systems based on anticipated occupancy i.e. 8, 12 and 24 hour.

In addition to centralised controls, the use of localised controls will further enhance energy efficiency at the point of use:

- thermostatic control of heat emitters: radiant panels, fan coil units and radiators etc.;
- presence-sensor control of wash-hand basin water outlets:
- thermostatic mixing valves at outlets; wash hand basins, sinks, baths and showers etc.;
- presence or occupancy control of heating and ventilation systems by operation of light switches, presence sensors, swipe or 'door key' cards etc.;
- thermostats, temperature and humidity sensors.

Subsequent to the detailed design of the building services, assessment of the energy requirement of the development may need to be adjusted.

4. Renewable Energy Technologies

The renewable technologies identified as most applicable to London are stated in the London Plan. Each of these technologies is considered in the context of the development.

- *Passive solar design*: the orientation of the development would lead to a net solar gain and hence the need for cooling to be provided. Mitigation measures to avoid the need for cooling have been designed in e.g. window orientation and window size and glazing specification.
- *Passive ventilation:* the corridors and Reglit glazed stairwells will act as ventilation pathways for the building corridors and common access areas *per se*. Ventilation in the residential and commercial units will be provided for by the tilt-turn double glazed windows.
- *Solar heating systems:* the use of solar thermal how water units (STHW) is acknowledged as a reasonable cost option for residential developments. The availability of appropriate roof area in the proposed development and a quoted value for solar heat gain in London of 454kWh/m^2 gives the potential to for 11m^2 of STHW panels to provide 40% of the total hot water demand of the development.
- *Ground source heat pump (borehole type):* identified as useful source of low carbon energy for heating. The preferred system for this location would be a vertical closed loop heat exchanger.
- *Wind turbines*: the potential of wind generated electricity is well documented. However the adverse effects of disturbances to wind flow patterns due to surrounding high buildings and hence the output of the generator, makes their viability in such locations marginal.
- *Solar Power Panels:* the cost of carbon reduction using PV panels is not a cost efficient method at current prices. Reduction in carbon use can be achieved more cost efficiently using other technologies.
- *Biomass fuelled combined heat and power facilities and biomass boilers:* woody biomass fuelled boilers are recognised as both carbon and cost efficient means of producing heat/hot water. Optimum benefit from CHP is obtained when the electrical and heating demands match that of the output of the CHP unit. In this instance, while the electrical and hot water demands will be generally constant through out the year, while the heating demand is focussed on a 4-5 month period. The high ratio of thermal to electrical energy would require the dumping of a significant thermal output for 7 8 months of the year, which is deemed a less efficient use of carbon in comparison with other available carbon efficient options

  Also of importance are the supply chain issue associated with biomass fuel pellets, the preferred option for unmanned boiler systems such as that likely to be used in this development. The supply side of pellets would need to be fully investigated to ensure that any proposed scheme was viable both in terms of supply quantities and fuel price. Due to the particular location of the site, the provision of suitable storage for the fuel store and vehicular access for fuel deliveries would be impractical to incorporate.

Based on the type of mixed development proposed and the technology specific factors associated with the above renewable and low energy systems as discussed above, the mix of renewable energy systems proposed comprises the following:

- Ground source heat pump: to provide 42MWh of the overall estimated heating demand of 146MWh/annum. A vertical, closed loop borehole system is suggested, which subject to subsequent detailed investigation would comprise a 100m deep borehole. The balance of the heating load will be provided by a natural gas condensing boiler with a SEDBUK rating of band B or above;
- Solar thermal hot water: to provide 5MWh of the estimated 13MWh/annum total hot water requirement using 11m^2 of solar thermal panels. The balance of the hot water load will be provided by the SEDBUK band B or above, natural gas condensing boiler.

The combination of these two energy systems will provide +21% energy generation from renewable/low carbon energy sources.

5. Rainwater Harvesting

Despite the fact that England and Wales appear to have plenty of rain, the growing population and the potential changes in climate places our water resources are under pressure.

The use of rainwater harvesting is increasingly required by Planning Authorities and is fully supported by the Environment Agency. The average per capita household water consumption in England and Wales is around 150l/d and for an office, 35l/day. Of the total amount of water used, on average 46% is for purposes that could use rainwater instead of mains supply. Collected rainwater can be used for all purposes, except drinking.

While there are no agreed water quality standards for rainwater use in England and Wales, if properly collected and only used only for non-potable needs such as toilet flushing, rainwater is not usually disinfected.

Washing machines can be fed by untreated rainwater but occasionally colour and odour may cause a problem. The recycling of bath and shower water (grey water) is not generally recommended, as there are additional hygiene issues from the risk of direct human contact that require significant additional equipment.

A rule of thumb for household water use is to size the tank at 5% of the rainwater supply, or of the annual demand, using the lowest figure of these two. The tank size is calculated from the catchment area, drainage coefficient and filter efficiency and rainfall using the following calculation:

Tank size (litres) = catchment area x drainage coefficient x filter efficiency x annual rainfall x 0.05.

Using a drainage coefficient for the green roof of about 0.4-0.5, a filter efficiency assumed as 90% , roof area of 220m^2 and the annual rainfall for London about 750mm, the potential rainwater harvested is between about 59 and 75m^3. A suitable sized storage tank would be between 3 - 4m^3.

On the basis that one householder uses about 55m^3/annum, the proposed rainwater harvesting system would provide for the non-potable water use needs of two residents.

6. Green Roofs

The use of green roofs offers both environmental and economic benefits. Environmental benefits include:

- ***Reduced storm water discharge rate***: the slow release of rainwater by the green roof reduces the size of the impact on the storm water system by allowing a slower release of water Water is stored by the substrate and then taken up by the plants from where it is returned to the atmosphere through transpiration and evaporation. The temporal delay of storm water runoff and the reduced runoff volume by a green roof reduces the amount of storm water runoff and also delays the time at which runoff occurs, resulting in decreased stress on sewer systems at peak flow periods
- ***Sound insulation:*** soil, plants and the trapped layer of air can be used to insulate for sound. Sound waves produced by machinery, traffic, planes etc. are absorbed, reflected or deflected. The substrate tends to block lower sound frequencies and the plants block higher frequencies. A green roof with a 12 cm substrate layer can reduce sound by 40 decibels, while a 20 cm substrate layer can reduce sound by 46-50 decibels.
- ***Reduced "urban heat island" effect***: The impact of green roofs in reducing the urban heat island (UHI) effect is still uncertain. Modelling studies for the city of Toronto have shown that the city's vegetation reduced the UHI effect by up to 1^0C over approximately 25% of the City. Using a simulated green roof coverage of 50%, the cooling effect was extended to approximately 33% of the City and increased the maximum cooling to 2^0C.
- ***Filtration of Airborne Particulates***: green roofs not only absorb rainwater and heat, the latter decreasing the tendency towards thermal air movement but will also filter the air moving across it. $1m^2$ of grass roof can remove about 0.2 kg of airborne particulates every year.
- ***Creation of Microclimates***: a green roof will have a noticeable impact on the heat gain and loss of a building, as well as the humidity, air quality and reflected heat in the surrounding neighbourhood. On a summer day, the temperature of a gravel roof can increase by as much as 25°C to between 60-80°C. Covered with grass, the temperature of that roof would not rise above 25 °C, resulting in energy cost savings. Rooms under a green roof are at least 3 - 4°C cooler than the air outside, when outdoor temperatures range between 25-30°C.
- ***Water Filtration***: green roofs not only retain the rainwater but also moderate the temperature of the water and act as natural filters for the run-off water.

While not all buildings are appropriate for establishing a green roof, due to the shape of the roof structure, the proposed re-development at 15a & 37 Camden High St. offers the opportunity to establish over 200^2m of green roof space.

7. Summary and Commitments

- An assessment of the anticipated energy demand, estimated in accordance with the requirements of the Part L regulations is shown below, together with the estimated demand after energy efficiency measures and the respective CO_2 emissions for each scheme:

Energy Type	Baseline Scheme		Energy Efficient Scheme with Renewable/Low Carbon	
	kWh	kg/CO_2	kWh	kg/CO_2
Electricity	78,000	32,800	74,000	31,100
Heating	154,000	29,900	146,500	24,700
Hot Water	13,000	2,500	13,000	1,600
Cooling	0	0	0	0
TOTAL	**245,000**	**65,200**	**233,500**	**57,400**

To meet energy efficiency and renewable/low carbon energy targets, the following options are potentially achievable for this development.

- Improvements in building design, insulation, improved window glazing standards and the use of energy efficient lighting and other electrical devices will reduce the estimated annual electrical and heating energy demand by 5%, to 233,500MWh;
- To meet the requirement for +10% energy generation onsite, 47,000kWh of energy is to be provided by renewable/low carbon sources;
- The largest energy use is for hot water/heating. The total heat demand for the development of 167,00kWh is a combination of hot water at 13,000kWh and space heating at 154,000kWh, as shown above.

  It is proposed to achieve the required target of +10% energy generation on site from renewable sources by installing a 5kW ground source heat pump, which will provide about 48% of the annual heating demand, combined with 11m^2 of solar thermal hot water panels, estimated to provide about 40% of the annual hot water demand of the proposed development.

  The expected hot water draw-off pattern for the residential units will vary during a typical day, with anticipated peak usage in the mornings and evenings. The commercial units will have a uniform drawdown during the working day. A high performance gas condensing boiler will supplement the output of the STHW unit and meet the additional heating demand.

  The inclusion of a hot water buffer tank will allow the accumulation of hot water produced by the STHW panels during high output periods, allowing both reduced use and capacity of the condensing gas boiler (SEDBUK rating of band B or above). A full system design will be needed to determine the location of the gas boiler and the sizing of the hot water accumulator tank.

- The target of generating +10% of the total estimated annual energy demand on site by renewable energy technologies is exceeded. The estimated reduction in energy demand through energy efficiency measures, compared with the baseline scheme, is estimated at 12,00kWh annually, equal to an annual CO_2 saving of 3,200kg, a reduction of about 5%.
- Overall saving in CO_2 emissions, from energy efficiency measures and renewable energy/low carbon technologies, is estimated as 7,800kg, 12% of the baseline scheme.
- Based on the above analysis, the applicant commits to investigate in more detail the two renewable energy/low carbon options above, to determine both the most applicable technology or combination of technologies for the development and those most likely to be able to achieve the +10% target of onsite renewable energy generation.

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