Energy & Sustainability Statement

Land To R/O 10-12 Bidwell Gardens
London
N11 2AX

8th March 2021

Prepared for:

GT Associates

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Contents

Appendices

1.0 Executive Summary

The proposed development project at Bidwell Gardens involves the development of the of rear ground to develop a new build single dwelling.

It has been designed to achieve the highest of environmental performance standards following the Energy Hierarchy as set down by the London Plan and the London Borough of Haringey's local plan policies.

The reports takes on board the latest GLA guidance on writing energy statements as well as taking into account matters raised with the new draft London Plan.

eb7 Sustainability Ltd have been appointed to develop a strategy and advise how the proposed development of a new build dwelling will comply with these requirements.

A 'Lean, Clean, Green' has been adopted and the development achieves an overall improvement (DER/TER) in regulated emissions at over **72.31%** above Part L 2013 standard, through the adoption of high standards of insulation and super-efficient heat pump driven heating & hot water systems as well as a roof mounted PV array.

2.0 The Site & Proposal

The proposed site at Bidwell Gardens is currently the rear grounds of properties facing onto the main road.

The development proposal is for a new-build development of 2 storey dwelling arranged of lower ground and ground floor.

2.1 Local Planning Context

The site sits within the London Borough of Haringey

Haringey's Development Management DPD was adopted in July 2017

The key policy is Policy DM21: Sustainable Design, Layout and Construction

A All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:

a Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;

b Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;

c Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls

d Wherever possible, use building materials with high environmental performance ratings; and

e Seek opportunities for locally sourced labour.

B The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings.

C Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.

D Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

2.2 The London Plan

On 10 March 2015, the Mayor published (i.e. adopted) the Further Alterations to the London Plan (FALP). From this date, the FALP are operative as formal alterations to the London Plan (the Mayor's spatial development strategy) and form part of the development plan for Greater London; the Plan has been further consolidated with further alterations in 2016.

Chapter 5 deals with London's Response to Climate Change and covers areas such as climate change - minimising energy; (see Policy 5.2 below), sustainable use of water, aggregates and other resources, reducing air and water pollution, managing flood risk and sustainable urban drainage systems, conserving and enhancing the natural environment and promoting sustainable waste behaviour.

Of particular significance is Policy 5.2 Minimising Carbon Dioxide Emissions, which requires: -

Development proposals should make the fullest contribution to minimising carbon dioxide emission in accordance with the following energy hierarchy:

1 Be lean: use less energy

2 Be clean: supply energy efficiently

3 Be green: use renewable energy

As part of this assessment, it must consider unregulated energy use not covered under the Building Regulations at each stage of the Energy Hierarchy i.e. cooking and appliances and use of equipment.

October 2018 saw the publication of "Energy Assessment Guidance - Greater London Authority guidance on preparing energy assessments as part of planning applications (October 2018)"

This document sets out the GLA's new approach to encourage SAP 10 carbon emission factors from January 2019, new requirements for developers to confirm which carbon emission factors they will use from January 2019 and a new section containing information on carbon emission factors.

"The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO2 emission performance against London Plan policies"

There is also a revised section on the requirements for refurbishment projects.

Key targets for residential development remain at 100% (zero carbon) with at least a 35% on-site reduction beyond Part L 2013

Commercial schemes now have to demonstrate at least a 35% on-site reduction beyond Part L 2013.

2.3 The New London Plan

The New London Plan has now been adopted; Chapter 9 deals with Sustainable Infrastructure:-

Policy SI1 Improving air quality

A London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality

d) create unacceptable risk of high levels of exposure to poor air quality.

5) Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.

Policy SI2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) Be lean: use less energy and manage demand during construction and operation.

2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.

3) Be green: generate, store and use renewable energy on-site.

B Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance.

C In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim to achieve 10 per cent, and non-residential development should aim to achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided:

1) through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or

2) off-site provided that an alternative proposal is identified and delivery is certain.Policy SI3 Energy infrastructure

D Major development proposals within Heat Network Priority Areas should have a communal heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

b) use available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)

c) generate clean heat and/or power from zero-emission sources

d) use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)

e) use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)

f) use ultra-low NOx gas boilers.

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that there is no significant impact on local air quality.

3) Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

Policy SI4 Managing heat risk

A Development proposals should minimise internal heat gain and the impacts of the urban heat island through design, layout, orientation and materials.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) minimise internal heat generation through energy efficient design

2) reduce the amount of heat entering a building through orientation, shading, albedo, fenestration, insulation and the provision of green roofs and walls

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) Provide active cooling systems.

Policy SI5 Water infrastructure

C Development proposals should:

1) minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)

2) achieve at least the BREEAM excellent standard (commercial development)

3) be encouraged to incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future proofing.

It is noted that the single dwelling residential development to rear of Bidwell Gardens would be considered a non-major full planning application and this report is informed accordingly based upon SAP10 calculation methodology in line with the very latest guidance from the GLA on the preparation of energy statements.

The formal GLA SAP10 emission conversion spreadsheet is attached at **Appendix D**.

3.0 Baseline energy results

The first stage of the Mayor's Energy Hierarchy is to consider the baseline energy model.

The following section details the baseline energy requirements for the development – the starting point when considering the energy hierarchy.

3.1 New Build Dwellings

The baseline emission levels – the Target Emission Rate (TER) - is obtained by applying the design to a reference 'notional' building the characteristics of which are set by regulations – SAP2012; The new Part L Building Regulations 2013 came into force on April 2014 and introduced a completely new notional dwelling as detailed below:-

Table 4 Summary of concurrent notional dwelling specification

Element or System	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area [1]
External Walls (including opaque elements of curtain walls) [6]	0.18 W/m²K
Party Walls	0.0 W/m²K
Floor	0.13 W/m²K
Roof	0.13 W/m²K
Windows, roof windows, glazed rooflights and glazed doors	1.4 W/m²K [2] (Whole window U-value)
	g-value = 0.63 [3]
Opaque doors	1.0 W/m²K
Semi glazed doors	1.2 W/m²K
Air tightness	5.0 m³/hr/m²
Linear thermal transmittance	Standardised psi values – See SAP Appendix R, except use of y=0.05 W/m²K if the default value of y=0.15 W/m²K is used in the actual dwelling
Ventilation type	Natural (with extract fans) [4]
Air conditioning	None
Element or System	Values
Heating System	Mains gas If combi boiler in actual dwelling, combi boiler; otherwise regular boiler Radiators
	Room sealed
	Fan flue
	SEDBUK 2009 89.5% efficient
Controls	Time and temperature zone control [5] Weather compensation
	Modulating boiler with interlock
Hot water storage system	Heated by boiler (regular or combi as above) If cylinder specified in actual dwelling, volume of cylinder in actual dwelling. If combi boiler, no cylinder. Otherwise 150 litres. Located in heated space. Thermostat controlled Separate time control for space and water heating
Primary Pipework	Fully Insulated
Hot water cylinder loss factor (if specified)	Declared loss factor equal or better than 0.85 x (0.2 + 0.051 V2/3) kWh/day
Secondary Space Heating	None
Low Energy Lighting	100% Low Energy Lighting
Thermal Mass Parameter	Medium (TMP=250)

SAP first creates the notional reference building, based upon the same shape and form as the proposed dwelling and applies the above the characteristics as defined in SAP2012.

Once all of the baseline emission rates have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development.

3.3 Unregulated Energy Use

The baseline un-regulated energy use for cooking & appliances in the residential units have been calculated using the SAP Section 16 methodology; the same calculation used for Code for Sustainable Homes (CfSH) Ene 7.

Appliances = $E_A = 207.8 \times (TFA \times N)^{0.4714}$

Cooking = (119 + 24N)/TFA

N = no of occupant SAP table 1B

TFA – Total Floor Areas

The unregulated energy use per sqm is summarised in Table 1 below having been converted to SAP10 emissions standards.

Table 1 – Unregulated Energy Use

Unit	Unregulated Energy Use Kg/sqm
Bidwell Gardens	6.78

The un-regulated emission rates are added to the baseline regulated emission rates (as calculated under 3.1 above) in order to set the total baseline emission rates before then applying the energy hierarchy in line with The London Plan and Haringey policies.

3.3 Baseline Results

The baseline building results have been calculated and are presented in Table 2 below.

The Baseline SAP outputs (which summarise the key data) are attached at **Appendix A**. The SAP10 emission conversion at **Appendix D**.

Table 2 – Baseline energy consumption and CO2 emissions

Unit	Target Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total baseline emissions Kg/sqm	Total baseline emissions Kg
Bidwell Gardens	18.6	6.78	25.40	2546.51
Scheme Total				**2547**

4.0 Design for energy efficiency

The first step in the Mayor's 'Energy Hierarchy' as laid out in Section 5 of The London Plan, requests that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimizing associated carbon dioxide emissions.

This section sets out the measures included within the design of the development, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO_2 produced by the building after the energy efficiency measures have been included. From these figures the overall reduction in CO_2 emissions, as a result of passive design measures, can be calculated. To achieve reductions in energy demand the following measures have been included within the design and specification of the building:

4.1 Passive Design

The National Planning Policy Framework emphasises the need to take account of climate change over the longer term and plan new developments to avoid increased vulnerability to the range of impacts arising from climate change. The UK Climate Impacts Programme 2009 projections suggest that by the 2080's the UK is likely to experience summer temperatures that are up to 4.2°C higher than they are today.

Accordingly, designers are to ensure buildings are designed and constructed to be comfortable in higher temperatures, without resorting to energy intensive air conditioning.

In line with current GLA Guidance, the project at Bidwell Gardens has had been designed to ensure the building is not vulnerable to overheating; to instigate consideration of the risk of overheating with the proposed development, the design team have followed the guidance within the London Plan, Section 5.9, which consider the control of overheating using the Cooling Hierarchy:-

1. **minimise internal heat generation through energy efficient design**

The project will be designed to best practice thermal insulation levels as noted, full details of which are noted under 4.3 below.

Not only does good insulation assist in reducing heat losses in the winter, it has a significant impact on preventing heat travelling through the build fabric during the summer.

2. **reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and wall**

The development site is based in a low rise suburban situation with the main aspect to the south west. The main living areas have large glazed areas ensuring good daylight levels.

There is to be a regime of tree planting along the southern boundary which will offer significant topographical shading/protection to the new dwelling from the southern sun

These deciduous trees will also allow useful solar gain during the heating season.

The semi-basement level of the main living areas will also add to this protection.

Bedroom areas are at ground floor level with reduced glazed areas in line with best practice passive design.

Glazing specification has been considered as part of the overheating risk and the specified new glazing will achieve a g-value of 0.45 or better in order to assist in reducing overheating risk from excessive solar gain.

3. **manage the heat within the building through exposed internal thermal mass and high ceilings**

All house is designed with floor to ceiling heights at circa 2.6m.

The new build structure is expected to be of traditional brick and block offering significant thermal mass able to absorb heat during the summer months, which can then be ventilated during the evening or overnight.

4. **passive ventilation**

The dwelling has been designed to offer the potential for cross ventilation and all glazing is designed to have opening areas to introduce high levels of natural levels of “purge” ventilation to further assist in the reduction of overheating risks in appropriate areas.

5. **mechanical ventilation**

Given the passive ventilation and cooling strategy as out lined above, it is proposed that all houses will be naturally ventilated via window mounted background (trickle) ventilation and opening windows for purge ventilation; there are no proposals to use high energy mechanical ventilation.

4.2 Heating System

The notional heating system considered under the "be lean – use less energy" section of the Energy Hierarchy, will consist of high efficiency condensing gas boilers providing under floor heating and domestic hot water to the units.

- A Rated boiler systems – (89%+ SEDBUK efficiency) & load compensation.
- Insulated primary pipework

To increase the efficiency in the use of the heating system, the following controls will be used to eliminate needless firing of the boilers.

- Boilers fitted with weather compensation systems

4.3 Fabric heat loss

Insulation measures will be utilised to ensure the calculated U-values exceed the Building Regulations minima, with specific guidance taken from the design team:-

- New wall constructions will be of a brick and block cavity with a full-fill PIR board and will target a U-Value of 0.18 or better.
- New Roof constructions are yet to be specified, but a lightweight construction achieving a U-Value of 0.12 will be targeted for both flat and pitched areas
- The newly laid floors will achieve a minimum u value of 0.14/0.15 subject to perimeter/area ratios

Glazing

- The new glazing for windows and doors will be triple glazed with an area weighted average U-Value of 1.2w/m^{2}K or better.

Air Tightness

- The new houses be tested to 5m^3/hr/m^2 in line with best practice for naturally ventilated dwellings.

Construction Details

- Heat loss via non-repeating thermal bridging within the new build elements will be minimised by the use of Accredited Construction Details for these new build units. An overall Y-Value <0.07 is targeted.

4.5 Ventilation

As noted above, the residential spaces are to utilise a low energy natural ventilation strategy, with trickle ventilation, opening windows and extract fans to wet room areas.

4.6 Lighting and appliances

The development will incorporate high efficiency light fittings utilising LED lamps.

External areas will also have an absence detection systems to ensure lights cannot be left on when not in use.

4.7 Energy efficiency results

The above data has been used to update the SAP models the Building Emission Rate outputs of which are attached at **Appendix B**, which are tabulated below: -

The following Table 3 shows the "be lean" emissions levels, as well as the overall emissions from the building based on SAP10 emissions.

Table 3 – Energy Efficient emission levels

Unit	Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total emissions Kg/sqm	Total emissions Kg
Bidwell Gardens	18.0	6.78	24.79	2485.54
Scheme Total				**2486**

The results show that the energy efficiency measures introduced have resulted in the reduction in CO_2 emissions from the development of **2.39%.**

In addition, the extract from the "Be Lean" SAP outputs (below) confirms that the Fabric Energy Efficiency (FEE), the measure of heating and cooling load within the SAP calculations, shoring an improvement of the baseline of over 13% - in line with London Plan requirements for major schemes.

1b TFEE and DFEE		
Target Fabric Energy Efficiency (TFEE)	69.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	60.2 kWh/m²	
		OK

SAP Extract – Regulations Compliance Worksheet

5.0 Supplying Energy Efficiently

The second stage in the Mayor's 'Energy Hierarchy' is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy where practical and appropriate.

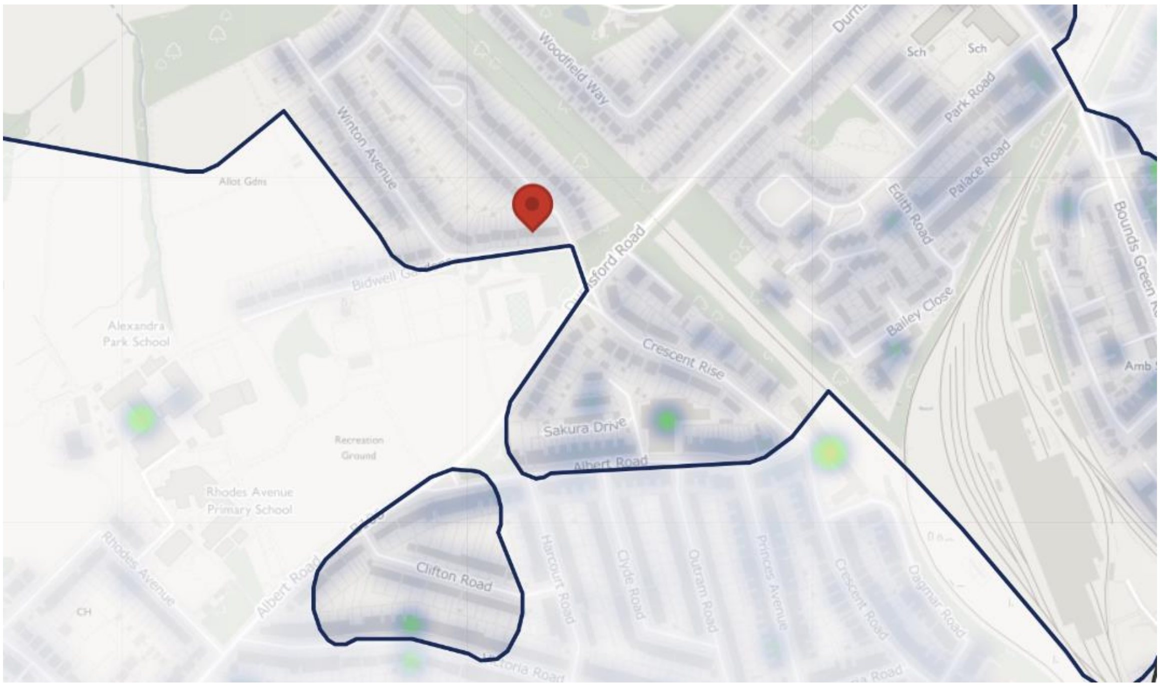
5.1 Community Heating/Combined Heat and Power (CHP)

The London Plan policy requires consideration of a development scheme's ability to connect to a district energy network or community heating scheme.

Combined heat and power systems are essentially biomass or fossil fuel fired electricity generators that use the heat by-product to provide space and water heating. The electricity generated can be used directly within the host buildings or sold to electricity suppliers on the national grid. These systems can be employed on a large scale for community schemes or at the micro scale for individual dwellings.

Alternatively larger scale systems operated as a standalone entity can be used to provide heat and power to the local neighbourhood.

The extract from the London Heat Map (reproduced below) identifies that the site is highly remote from any proposed district energy network and is NOT within a heat network priority area.



Extract from London Heat Map

In the medium term, the project is also required to consider the use of on-site CHP.

5.2 On-site CHP/District Heating

A community heating network comprises a series of insulated pipes used to deliver heat, in the form of hot water or steam, to a number of different locations or dwellings. They range from small, providing heat to a house and a couple of holiday cottages for example, to large scale systems supplying housing estates or blocks of houses.

The heat production facility for a DH scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

CHP systems are essentially biomass or fossil fuel fired electricity generators that use the heat by-product to provide space and water heating. The electricity generated can be used directly within the host buildings or sold to electricity suppliers on the national grid.

CHP is, as a rule of thumb, is only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand. In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual baseline heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

Clearly, as a single unit domestic development, with only the limited year round DHW demand to support a CHP installation (only 2-4 hours per day in the May – October period), the economy of scale, in terms of year-round demand, simply isn't present and as such the potential use of on-site CHP can be dismissed.

6.0 Renewable Energy Options

The final element of the Mayor's 'Energy Hierarchy' requires development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, wave's tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the suns energy through photosynthesis.

The energy efficiency measures and the sourcing the energy efficiently outlined above have the most significant impact on the heating and hot water energy requirements for the development, and the associated reduction in gas consumption.

This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings
- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

6.1 Government incentives

6.1.1 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally launched by the UK Government on 10th March 2011. The RHI will pay a tariff payment to renewable technologies that provide heat energy from a renewable source, with the payment relating to the kWh of heat energy provided e.g. if a property has a heat load of 20,000 kWh per annum, and it is 100% provided from a renewable source, then the tariff is paid against the 20,000kWh.

The Government decided on a two stage delivery - the first stage being for non-domestic schemes, commencing in July 2011, with domestic schemes introduced in April 2014.

6.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontal axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology

The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The site is flanked by other properties in most directions. To overcome these obstructions and to receive practical amounts of non-turbulent wind, the blades of a wind turbine would need to be placed significantly above the roof level of the surrounding buildings and the proposed project at Bidwell Gardens itself.

It is inconceivable that any wind turbines of this size would be considered acceptable in this location.

6.3 Solar Energy

The proposed development has areas of flat roof that could accommodate solar panels orientated to the south.

In general, the roof will have an unrestricted aspect, so there is scope therefore to site solar photovoltaic (PV) or water heating equipment at roof level.

6.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Both collector types can capture heat whether the sky is overcast or clear. Depending on location, approximately 900–1100 kWh of solar energy falls on each m^2 of unshaded UK roof surface annually. The usable energy output per m^2 of solar panel as a result of this amount of insolation ranges from between 380 – 550 kWh/yr.

Solar hot water systems are of course, displacing gas for DHW provision (as noted above), and due to the low cost of gas as a source of energy, solar thermal systems tend to have a very poor pay back model unless there is a reliable and consultant demand for hot water; a small size residential scheme simply does not provide this

Accordingly, given the limited roof space available and the strategy to off-set the electrical use, solar PV may be a stronger candidate (see below) and offer a greater return in terms of a return on investment.

Accordingly, solar thermal would not be the optimum solution for the proposed development.

6.3.2 Photovoltaics (PV)

A 1kWp (1 kilowatt peak) system in the UK could be expected to produce between 790-800kWh of electricity per year based upon a south east orientation according to SAP2005 methodology used by the Microgeneration Certification Scheme (MCS). The figure given in the London Renewables Toolkit is 783 kWh per year for a development in London.

The withdrawal of the Feed in Tariff has led to much reduced returns from PV panels, however, significant saving can be made on the ever increasing price of electricity.

Accordingly, it is proposed to install 4 x 330w PV panels at roof level, generating some 1086.82kWh/annum, further reducing the carbon footprint of the proposed dwelling.

6.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel – which can be very bulky items. There also needs to be a local source of biomass fuel that can be delivered on a regular basis. There are also issues with fuel storage and delivery which mitigate against this technology. There is inadequate space at ground floor level for a fuel store and limited access for delivery lorries.

Additionally, a boiler of this type would replace the need for a conventional gas boiler and therefore offset all the gas energy typically used for space and water heating. However, biomass releases high levels of NO_x emissions and particulate matters, as well as other pollutants and would therefore have to be considered carefully against the high standard of air quality requirements within the London boroughs. Accordingly, the use of biomass is not considered appropriate for this project.

6.6 Ground source heat pump

All heat pump technologies utilise electricity as the primary fuel source – in this case displacing gas, as such, the overall reduction in emissions when using this technology can be less effective when opposed to a technology that is actually displacing electricity.

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a 'heat pump'. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by 'condensing' the heat taken from the ground, producing hot water temperatures in the region of 45°C. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under floor heating system.

The use of a ground source heating/cooling system will therefore require:

- Vertical borehole or ground loop
- Use of under floor heating
- Space for heat pump unit

Utilising ground loop collectors, a GSHP needs circa 2.5 x NIA in external space; clearly, there is insufficient land area to install low level collector loops, leaving deep bore GSHP as the only potential option.

Normally the boreholes would need to be 6 to 8 metres apart and a 100 metre deep borehole will only provide about 5kw of heat. The borehole should also be formed around 3m away from the perimeter of the building and most specialists don't recommend using the structural boreholes.

Clearly, in the case of the proposed development, there is no scope for the locating of the ground collector devices and as such, ground source heating cannot be considered.

6.7 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

It must be remembered that heat pumps utilise grid based electricity and the associated emissions, so that the actual reduction in emissions can be limited.

Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 100% of the space heating/hot water demand, then the system would reduce the overall CO_2 emissions by approximately 60%. The table below demonstrates, on the assumption of a demand of 1000Kwh/year for heating and hot water assuming the use of SAP10 data.

Table 4 – ASHP Performance

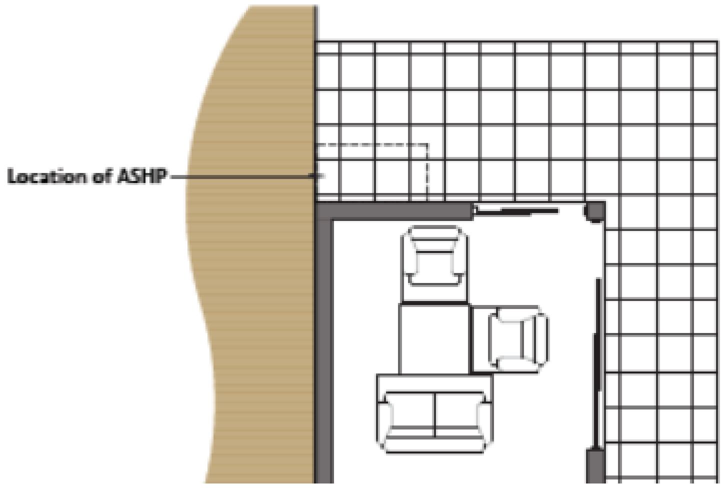
Type of Array	Energy Consumption (Kwh/yr.)	Emission factor ($kgCO_2$/Kwh)	Total CO_2 emissions (kg/annum)
90% efficient gas boiler	1111	0.216	2400
320% efficient ASHP	2813	0.233	655
100% efficient immersion (back-up)	1000	0.233	233

A theoretical carbon saving of 63%

With the above data in mind, clearly an ASHP could be an option; accordingly, the design team are proposing the use of an air to water heat pump to deliver the heating and hot water to the proposed development.

Conservatively, the heat pump will operate at some 320% efficiency, and this has been reflected in the "Be Green" SAP outputs at **Appendix C.**

The heat pump will be located within an acoustic enclosure on the patio area as marked, away from neighbouring properties so as not to cause a visual, or acoustic nuisance, whilst equally, not impacting on the quiet enjoyment of the amenity space.



Heat Pump Location

6.8 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use the above noted air to water heat pump technology to provide the heating and hot water to the new dwelling, supplemented by the 4 panel PV array.

The final table – Table 5 – summarises the final outputs from the SAP models; attached at **Appendix C.** The SAP10 conversion spreadsheet is attached at **Appendix D**

Table 5 – "Be Green" emission levels

Unit	Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total emissions Kg/sqm	Total emissions Kg
Bidwell Gardens	5.2	6.78	11.94	1196.51
Scheme Total				**1197**

The data at Table 5 confirms that overall emissions – including unregulated energy use - have been reduced by **53.00%** over and above the baseline model, with a **51.85%** reduction in emissions directly from the use of energy generating and renewable technologies, i.e. over and above the energy efficient model.

Excluding the un-regulated use, i.e. considering emissions controlled under AD Part L, then the final reduction in DER/TER equates to **72.31%.**

7.0 Sustainable Design & Construction

The Code for Sustainable Homes (the Code)

The Code was the national standard for the sustainable design and construction of new homes.

This has now been formally withdrawn by DCLG, and planning authorities are no longer able to require developments to meet the technical guidance within the Code for Sustainable Homes

However, the applicants do acknowledge some requirements from the Mayor's Sustainable Design & Construction SPD, which will also be required under Haringey's sustainable design and construction SPD March 2013), and will actively introduce the following elements to the development:-

Materials

New build construction techniques will be considered against the BRE Green Guide to ensure that, where practical, the most environmentally friendly construction techniques are deployed.

Construction materials will be sourced from suppliers capable of demonstrating a culture of responsible sourcing via environmental management certification, such as BES6001

Insulation materials will be selected that demonstrate the use of blowing agents with a low global warming potential, specifically, a rating of 5 or less. Additionally, all insulants used will demonstrate responsible sourcing of material and key processes.

The principle contractor with be required to produce a site waste management plan and sustainable procure plan, in line with BREEAM requirements – this will include a pre-demolition audit to identify demolition materials to reuse on-site or salvage appropriate materials to enable their reuse or recycling off-site. The procurement plan will follow the waste hierarchy Reduce; Reuse & Recycle.

A Site Waste Management Plan (SWMP) will be developed prior to commencement of development stage to inform the adoption of good practice waste minimisation in design. This will set targets to minimise the generation of non-hazardous construction waste using the sustainable procurement plan to avoid over-ordering and to use just-in-time delivery policies.

Waste and recycling – appropriate internal and external storage space will be provided to ensure that residents can sort, store and dispose of waste and recyclable materials in line with Haringey's collection policies.

Pollution

The contractor will also monitor the use of energy and water use during the construction phase and incorporate best site practices to reduce the potential for air (dust) and ground water pollution.

Building services will emit zero local pollutants; being 100% electrical driven.

The main contractor will be required to register the site with the Considerate Constructors Scheme and achieve a best practice score of 25 or more.

To void the issue of noise pollution, the development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings.

Energy

The dwelling will incorporate renewables technologies as noted in the main report above.

The new home will also be supplied with a Home User Guide offering practical advice on how to use the home economically and efficiently.

This will be further enhanced by the installation of smart energy metering, enabling occupants to accurately assess their energy usage and thereby, manage it.

Water

The development minimise water use as far as practicable by incorporating appropriate water efficiency and water recycling measures. The applicants will ensure that the dwelling meet the required level of 105 litres maximum daily allowable usage per person in accordance with Level 4 of the Code for Sustainable Homes.

Rainwater butts will be installed and connected to rainwater pipes to enable the recycling of rainwater for the upkeep of soft landscaping.

8.0 Conclusions

This report has detailed the baseline energy requirements for the proposed development, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO_2 reductions using renewable energy technologies.

The baseline results have shown that if the development was built to a standard to meet only the minimum requirements of current building regulations, the total amount of CO_2 emissions would be **2547Kg/year**.

Following the introduction of passive energy efficiency measures into the development, as detailed in section 4, the total amount of CO_2 emissions would be reduced to **2486Kg/year**

There is also a requirement to reduce CO_2 emissions across the development using renewable or low-carbon energy sources. Therefore the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the most suitable solution to meeting reduction in CO_2 emissions would be via the use of an air source heat pump for heating and hot water production.

This has been used in the SAP models (reproduced at **Appendix C**) for the development which have also been detailed above in Table 5, which show a final gross emission level of **1197Kg/year**, representing a total reduction in emission over the baseline model, taking into account unregulated energy, of **53.00%.**

In addition, the final SAP outputs at Appendix C demonstrate that the building achieves an overall improvement in regulated emissions over the Building Regulations Part L standards for regulated emissions of minimum of 72.31%.

Tables 6 & 7 Demonstrate how the Bidwell Gardens project complies with the London Plan requirements and the GLA guidance relating to zero carbon development.

Table 6 – Carbon Emission Reductions – Domestic Buildings

Key	Tonnes/annum
Baseline CO_2 emissions (Part L 2013 of the Building Regulations Compliant Development)	1.87
CO2 emissions after energy demand reduction (be lean)	1.81
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean)	1.81
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)	0.52

Table 7 – Regulated Emissions Savings – Domestic Buildings

	Regulated Carbon Dioxide Savings	
	(Tonnes CO2 per annum)	%
Savings from energy demand reduction	0.06	3.21
Savings from heat network	0.00	0.00
Savings from renewable energy	1.29	68.98
Total Cumulative Savings	1.35	72.19
	(Tonnes CO_2)	
Carbon Shortfall	0.52	
Cumulative savings for off-set payment	15.60	
Cash-in-lieu Contribution	N/A	

Appendix A

Baseline/Un-regulated Energy Use:-

SAP Outputs & Target Emission Rates

Appendix B

Energy Efficient Design:-

SAP Outputs & Dwelling Emission Rates

Appendix C

Generating energy on-site:-

SAP Outputs Dwelling Emission Rates

Appendix D

SAP 10 Emissions:-

GLA SAP10 Conversion Spreadsheet