If a turbine was placed at roof level of the development the annual mean wind speed would be between 4.8 and 5.6 m/s. Wind speeds in this range are at the bottom end of what would be a sufficient speed for a wind turbine to be effective. Figure 10 shows the power output curve as a function of wind speed for a Proven 2.5 kW turbine. To achieve peak output, a wind speed of over 10 m/s is required.

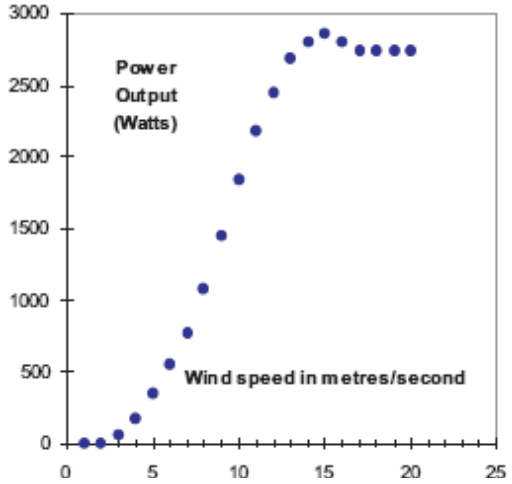

Figure 7 Output of Proven 2.5 kWh Turbine

Based on the expected emission rate of the retail and residential components the number of turbines required to offset 10% of the development's CO_2 emissions is approximately 10 micro-turbines. Table 11 below details the number of turbines required for a corresponding wind turbine specification as well as a basic financial analysis. The turbine output is based on the Proven Wind Turbine data given the estimated BERR calculated wind speed.

Table 11 Wind Turbine Requirements to Offset 10% CO_2 Emissions

Turbine Rating	Diameter	Number of wind turbines required meet CO_2 Offset	Capital Cost per Turbine	Energy generated per year	Payback Period	CO_2 Reduction
	m		£	kWh	years	%
2.5 kW	3.5	10	13,000	25,000	52	10%
6 kW	5.5	5	21,000	30,000	35	12%
15 kW	9	2	44,000	30,000	30	12%

The results in Table 11 indicate that it is not feasible to have roof mounted wind turbines to offset the required full 10% CO_2 reduction through renewable energy generation. The annual mean wind speed at the site is at the bottom end of what is a sufficient speed for wind turbines to be effective. The financial analysis showed that payback periods were in excess of 30 years.

Based on the geometry of the roof and the turbine size, it is not feasible to install wind turbines to offset a full 10% CO_2 reduction. Furthermore, the visual impact of the turbines is likely to affect the planning application. Therefore due to the geometry of the roof, the visual impact and predicted low wind speeds for the site, wind turbines are not recommended for this development.

4.5 Ground Source Heat Pumps / Cooling

A ground source heating or cooling system operates by either rejecting heat from the building into the ground or upgrading the heat from the ground to a usable temperature.

There are two principle ground source heating and cooling systems available:

1. Open loop; and
2. Closed loop.

An open loop system draws water from an aquifer via a borehole, uses the energy in the water and rejects it to the same aquifer. A closed loop system uses a continuous network of pipe work buried in the ground to circulate the water which transfer the heat either from the water to the ground or from the ground to the water depending on the mode of operation required (heating or cooling). Figure 6 shows the simplified operation of a closed loop ground source heating system.

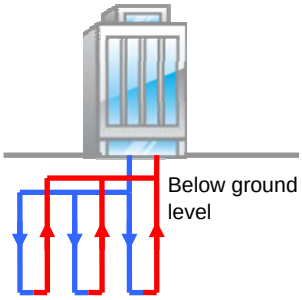

Figure 8 Ground Source Heating Example

The advantages and disadvantages of ground source heat pumps and cooling are listed below:

Advantages:

- ✓ Able to provide heating and cooling modes.
- ✓ Minimal visual impact for the development compared to other heating and cooling systems.
- ✓ Have the ability to provide good CO_2 emissions reductions.

Disadvantages:

- × High capital cost per Tonne of CO_2 saved.
- × Fuel source is not renewable.
- × Low heating temperatures.
- × System has complex controls and hydraulic network.
- × Operates best if the heating and cooling loads are matched.
- × Open loops are a high risk technology as there is no guarantee the required flow rate from aquifer will be achieved until it is sunk and tested.

4.5.1 Ground Source Heat Pumps / Cooling Impact

Given the development at 10 Jamestown Road is a refurbishment we would not recommend the installation of a ground source system.

4.6 Biomass Boilers

Biomass is the term used to describe a fuel that is produced from vegetation, e.g. wood, grass, sunflower oil etc. The most common and readily available in the UK currently is wood. Biomass is considered a renewable fuel source as the fuel absorbs more CO_2 when growing than it releases when burnt (including all manufacturing and transportation emissions). Wood can be used in log form, chipped or in pellets.

Biomass pellets are the easiest to store, transport, deliver and give a more predictable quantity of heat per tonne. The boiler selected can only burn one type of wood fuel. Biomass systems have been used in Europe for a considerable time and the technology is proven and predictable. The boilers are slower to start, stop and have less modulation than a conventional system and therefore act best where the heat output is consistent.

At a small scale the biomass boiler replaces the conventional gas boiler. The fuel supply chain is now well established and the number of available boilers has increased significantly. However storage of the fuel requires considerable space and the boilers are difficult to modulate with load and less efficient than a conventional condensing boiler.

The main advantages and disadvantages of a biomass boiler are discussed below:

Advantages:

- ✓ Proven technology
- ✓ Simple technology

Disadvantages:

- × Considerations need to be made into the delivery and storage of the fuel.
- × A biomass boiler has higher maintenance costs than a conventional fossil fuel powered one.
- × Regular maintenance is required.
- × A biomass boiler requires a dedicated flue.
- × Increased NOX emissions.
- × Management of fuel supply required.
- × Uncertainty of a fixed fuel cost.
- × Only suitable for developments with domestic hot water demand.

4.6.1 Biomass Boilers Impact for the Commercial Component

The future of biomass systems is currently uncertain due to deficiencies in the currently available fuels. A government review has recently concluded that the wider impact of bio fuels can be extremely negative. This is especially true of bio-diesel whose production is currently diverting land from food production in some parts of the world.

A biomass boiler requires increased space for storage of fuel and the boiler itself is considerably larger than the equivalent gas-fired boiler. Woodchip and pellet boilers also put a lot of responsibility on the owner to manage the supply of fuel which can be off-putting to potential buyers. For the reasons discussed above we would not recommend biomass boilers for the development.

4.7 Solar Hot Water Heating (SHWH)

Solar hot water heating consists of a generally south facing panel located externally, typically on the roof. Water is circulated through the panel and stored for use in a hot water calorifier.

The efficiency of a solar thermal hot water system depends primarily on the collector type and installation location. The optimum orientation would be south facing and at a 30° inclination.

There are two types of solar thermal hot water collectors:

- Flat Plate; and
- Evacuated Tube.

A flat plate system is the most common and consists of a weatherproofed, insulated box with a black metal absorber sheet and inbuilt pipes. The water in the pipes is heated through solar energy absorption which causes the water to circulate through the system by natural convection. A flat plate solar hot water collector needs to be located on a south (ideally sloping) roof of the building. A flat plate solar thermal hot water collector is shown in Figure 7.

An evacuated tube system consists of several glass tubes. The advantage of evacuated tube technology is that the solar collectors can be wall mounted or located on a flat roof. Figure 8 shows an evacuated tube solar thermal collector.

Figure 9 Flat Plate, roof Integrated Solar Thermal Hot Water System

(www.solfex.co.uk)

Figure 10 Evacuated Tube Solar Thermal Hot Water System

(www.solfex.co.uk)

The advantages and disadvantages of solar thermal hot water heating are listed below:

Advantages:

- ✓ The system is simple system to install.
- ✓ Relatively low maintenance required.
- ✓ The system can operate throughout the year.
- ✓ The running costs are minimal (limited to the small electrical load for pumps).

Disadvantages:

- × It is not possible to provide 100% of the annual hot water demand due to the difference of the solar gain profile and demand for hot water.
- × A large surface area is required for the collectors.

4.7.1 Solar Hot Water Impact

In residential developments Solar Hot Water Heating tends to be a cost effective solution. There is potential for roof mounted solar thermal hot water collectors to be installed to supply the residential hot water demand. Solar thermal hot water collectors could be placed on the residential roof and angled to face south. The SAP calculations have been used to assess the potential benefit of the addition of SHWH for each apartment.

Table 12 below shows that solar thermal hot water collectors can provide a 19% renewable energy contribution for the residential component. The results also show that an area weighed reduction of 25% is achieved from the Part L Minimum (this satisfies the Code for Sustainable Homes Level 3 mandatory energy target).

Table 12 Solar Thermal Hot Water Results

Typical Dwelling Description	Dwellings with Energy Efficiency Improvements (DER)	LZC Description (area STHW)	Proposed Design Featuring Energy Efficiency Improvements and PVS	Renewable Energy Contribution	Code for Sustainable Homes Level 3 must be 25% Reduction in $C0_2$ (From TER)
	kg CO2 / m2 / year		kg CO2 / m2 / year		
Unit 3.1	16.33	2.0	12.71	22%	27%
Unit 3.2	15.07	2.0	12.12	20%	25%
Unit 3.3	16.98	2.0	13.00	23%	28%
Unit 3.4	17.03	2.0	13.20	22%	27%
Unit 3.5	18.42	2.0	13.98	24%	28%
Unit 3.6	15.27	2.0	12.79	16%	22%
Unit 4.1	16.50	3.5	13.69	17%	25%
Unit 4.2	16.42	3.5	13.56	17%	24%
Unit 4.3	16.62	3.5	14.27	14%	21%
Total Area:	**16.39**	**22.5**	**13.32**	**19%**	**25%**

4.8 Photovoltaic Panels

Photovoltaic (PV) panels convert the energy from the sun into electricity. As with the Solar Hot Water Heating panels, it is optimum for PV panels to be located in a south facing direction and preferably at an inclination angle of approximately 30 degrees.

Figure 11 to the right shows a roof mounted photovoltaic array.

Figure 11 Roof Mounted Photovoltaic Array

(www.solardirect.com)

The advantages and disadvantages of photovoltaic panels are listed below:

Advantages:

- ✓ High profile technology.
- ✓ Manufacturers often provide long warrantees.
- ✓ Low visual impact for the development if located on the roof.
- ✓ Low Maintenance.

Disadvantages:

- × High Capital cost.
- × Based on current grid supplied electricity prices the payback of PV exceeds the life of the product.
- × Large area of roof space required.

4.8.1 Solar Photovoltaics (PV) Impact

For the Jamestown Road development, solar photovolatics present the best option for CO_2 reduction for the retail component. Using photovolatics reduces the restrictions on incoming tenants. Using the maximum available area of available roof space, whilst at the same time allowing for adequate spacing to prevent over shading the following area of photovoltaics can be applied to the development:

- **159.5m^2** located roof at a 30 degree inclination (allows space for residential SHWH panels)

Current installed costs of solar photovoltaics vary from £750/m^2 to £1200/m^2. A 115m^2 installation will therefore cost between £119,625 and £191,400. Incorporating the newly confirmed feed-in tariffs of approximately 31p per kWh of produced energy produced (regardless of whether it is used on site or not) it is expected the photovoltaic array will generate an annual payout of £12,000 a year over the 25 year expected life. This corresponds to a payback period of 16 years using the mid case assumptions. The analysis of rate of return is shown in Figure 12 below:

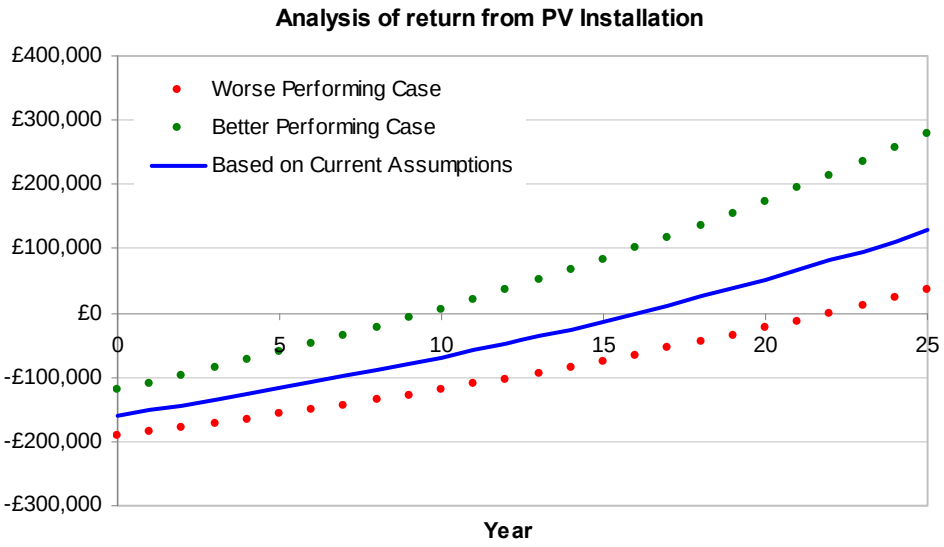

Figure 12 Analysis Rate of Return 159.5m^2 of Photovoltaics

Assumptions:	• • Worse Performing Case	— Current Assumptions	• • Better Performing Case
% Exported to the grid	100%	25%	0%
PV output	100 kwh/m^2	112.5 kwh/m^2	150 kwh/m^2
PV Cost	£1200 / m^2	£1000 / m^2	£750 / m^2

Table 13 PV Energy Results

Renewable Energy Contribution	11%
Size of PV array (m^2)	159.5m^2
Capital Cost	£119,625 and £191,400
Payback Period (years)	Approximately 16 years with the feed-in-tariff

The use of photovoltaics was also modelled for the residential apartments and it was found that with the same total area of solar collectors (i.e. 182m^2) a 10% renewable energy offset could be achieved through 40m^2 of PVs for the residential component and 142m^2 for the retail component.

4.9 Low and Zero Carbon Technology Conclusion

The Low Carbon and Renewable Energy study has showed that a combination of Solar Thermal Hot Water (STHW) systems and solar photovoltaics (PVs) provide the best option to meet the Camden Council 10% CO_2 reduction. They also make a significant contribution towards the GLA target of 20%.

SBEM and SAP modelling was conducted with the combined renewable strategy to show that the 10% CO_2 offset could be met through this strategy. Two equivalent options have been proposed to achieved the 10% renewable energy reduction. For planning purposes we will assume Option A, though Option B could also be applied as both have the same area of solar collectors.

These are detailed in Table 14 below:

Table 14 Renewable Energy Strategy Options

	Option A:	Option B:
Residential Component	$2m^2$ for Level3 units and $3.5m^2$ for level 4 units **Total Area: $22.5m^2$**	$4.15m^2$ for each apartment (equivalent to 3 modules based on Mitsubishi system, brochure as attached) **Total Area: $40m^2$**
Retail Component	$182m^2$ (total area)- $22.5m^2$ (STHW resi) = **$159m^2$ PV**	$182m^2$ (total area)- $40m^2$ (PV resi) = **$142m^2$ PV**
Renewable Energy Offset:	10.7%	9.7%
Total reduction from Part L:	29%	28%

4.10 Final Energy Efficiency Calculations

The provision of energy efficiency improvements as well as roof mounted photovoltaics and solar thermal hot water systems has led to a significant carbon emissions reduction. Table 15 below sets out the total reduction in CO_2 emissions achieved through the measures discussed in the previous sections.

The proposed design (new and change of use areas) achieves a 29% improvement from the minimum energy requirements of the Building Regulations Part L. Of this improvement 11% is achieved through renewable energy generation. **Error! Reference source not found.** summarises these results.

Table 15 Summary of Final Energy Calculations

	Emissions $kgCO_2$ / year
Baseline Emissions	178,007
Improved Emissions (after application of energy efficiency initiatives)	141,460
Improved Emissions (after incorporation of LZC technologies)	126,370
Total Improvement over Part L (TER to Proposed Design)	**29%**
Low and Zero Carbon Technology Contribution (BER to Proposed Design)	**11%**

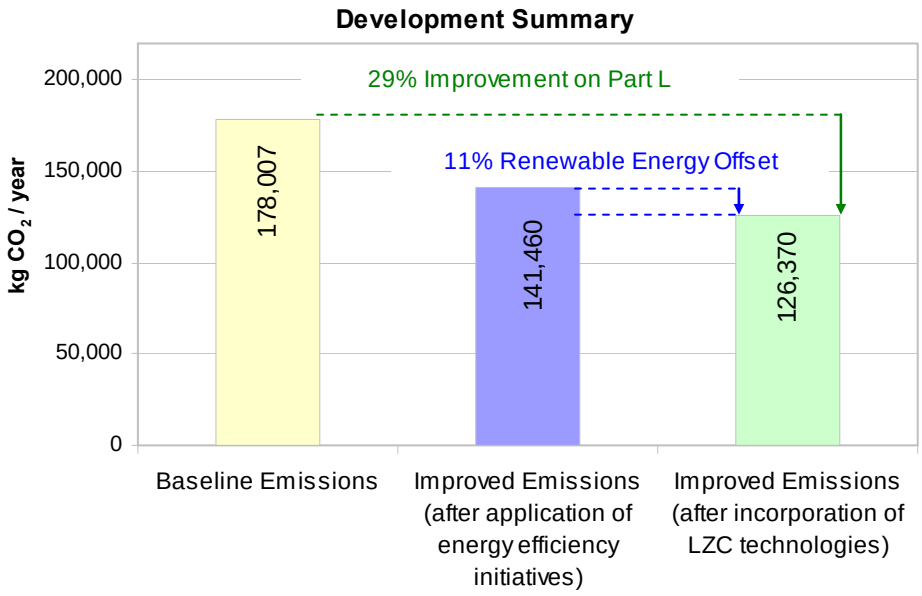

Figure 13 Final Energy Efficiency Results

Appendix A – BREEAM Retail 2008 Pre-Assessment

Indicative Overall BREEAM Score

55.18%

Ref	Title	Retail Criteria	Number of BREEAM credits available	Total predicted BREEAM credits achieved	Shell & Core Assessment Evidence Used?
Management					
Man 1	Commissioning	One credit where evidence provided demonstrates that an appropriate project team member has been appointed to monitor commissioning on behalf of the client to ensure commissioning will be carried out in line with current best practice. Two credits where, in addition to the above, evidence provided demonstrates that seasonal commissioning will be carried out during the first year of occupation, post construction (or post fit out).	**2**	**1**	Option 2 - Green Building Guide
Man 2	Considerate Constructors	One credit where evidence provided demonstrates that there is a commitment to comply with best practice site management principles. Two credits where evidence provided demonstrates that there is a commitment to go beyond best practice site management principles.	**2**	**2**	
Man 3	Construction Site Impacts	One credit where evidence provided demonstrates that 2 or more of items a-g (listed below) are achieved. Two credits where evidence provided demonstrates that 4 or more of items a-g (listed below) are achieved. Three credits where evidence provided demonstrates that 6 or more of items a-g are achieved: a. Monitor, report and set targets for CO2 or energy arising from site activities b. Monitor, report and set targets for CO2 or energy arising from transport to and from site c. Monitor, report and set targets for water consumption arising from site activities d. Implement best practice policies in respect of air (dust) pollution arising from the site e. Implement best practice policies in respect of water (ground and surface) pollution occurring on the site f. Main contractor has an environmental materials policy, used for sourcing of construction materials to be utilised on site g. Main contractor operates an Environmental Management System. One additional credit where evidence provided demonstrates that at least 80% of site timber is responsibly sourced and 100% is legally sourced.	**4**	**3**	
Man 4	Building user guide	One credit where evidence provided demonstrates the provision of a simple guide that covers information relevant to the tenant/occupants and non-technical building manager on the operation and environmental performance of the building.	**1**	**0.5**	Option 2 - Green Building Guide
Man 8	Security	One credit where evidence provided demonstrates that an Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA) from the local police force has been consulted at the design stage and their recommendations incorporated into the design of the building and its parking facilities (if relevant).	**1**	**1**	

Indicative Mangement (weighted) Section Score **9.00%**

Health & Wellbeing

Hea 1	Daylighting	One credit where evidence provided demonstrates at least 35% of the sales and common floor area (if relevant) is adequately daylit.	1	0	
Hea 4	High frequency lighting	One credit where evidence provided demonstrates that high frequency ballasts are installed on all fluorescent and compact fluorescent lamps.	1	0.5	Option 2 - Green Building Guide
Hea 5	Internal and external lighting levels	One credit where evidence provided demonstrates that all internal and external lighting, where relevant, is specified in accordance with the appropriate maintained illuminance levels (in lux) recommended by CIBSE.	1	0.5	Option 2 - Green Building Guide
Hea 8	Indoor air quality	One credit where air intakes serving occupied areas avoid major sources of external pollution and recirculation of exhaust air.	1	0	
Hea 9	Volatile Organic Compounds	One credit where evidence provided demonstrates that the emissions of VOCs and other substances from key internal finishes and fittings comply with best practice levels.	1	0.5	Option 2 - Green Building Guide
Hea 10	Thermal comfort	One credit where evidence provided demonstrates that thermal comfort levels in occupied spaces of the building are assessed at the design stage to evaluate appropriate servicing options, ensuring appropriate thermal comfort levels are achieved.	1	0.5	Option 2 - Green Building Guide
Hea 12	Microbial contamination	One credit where evidence provided demonstrates that the risk of waterborne and airborne legionella contamination has been minimised.	1	0.5	Option 2 - Green Building Guide
		Indicative Health & Wellbeing (weighted) Section Score	**5.36%**		

Energy

Ene 1	Reduction of CO2 Emissions	Up to fifteen credits where evidence provided demonstrates an improvement in the energy efficiency of the building's fabric and services and therefore achieves lower building operational related CO2 emissions.	15	5	Option 3 - Actual Specification
Ene 2	Sub-metering of Substantial Energy Uses	One credit where evidence provided demonstrates the provision of direct sub-metering of energy uses within the building.	1	0.5	Option 2 - Green Building Guide
Ene 3	Sub-metering of high energy load Areas and Tenancy	One credit where evidence provided demonstrates sub-metering of energy consumption by tenancy/building function area is installed within the building.	1	0.5	Option 2 - Green Building Guide
Ene 4	External Lighting	One credit where energy-efficient external lighting is specified and all light fittings are controlled for the presence of daylight.	1	1	Option 3 - Actual Specification
Ene 5	Low zero carbon technologies	One credit where evidence provided demonstrates that a feasibility study considering local (on-site and/or near site) low or zero carbon (LZC) technologies has been carried out and the results implemented. Two credits where evidence provided demonstrates that the first credit has been achieved and there is a 10% reduction in the building's CO2 emissions as a result of the installation of a feasible local LZC technology. Three credits where evidence provided demonstrates that the first credit has been achieved and there is a 15% reduction in the building's CO2 emissions as a result of the installation of a feasible local LZC technology. Or alternatively: A maximum of one credit where evidence provided demonstrates that a contract with an energy supplier is in place to provide sufficient electricity used within the assessed building/development to meet the above criteria from a 100% renewable energy source. (Note: a standard Green Tariff will not comply)	3	2	
		Indicative Energy (weighted) Section Score	**8.14%**		

Transport

Tra 1	Provision of public transport	Up to five credits are awarded on a sliding scale based on the assessed buildings' accessibility to the public transport network.	**5**	**5**	
Tra 2	Proximity to amenities	One credit where evidence provided demonstrates that the building is located within 500m of accessible local amenities appropriate to the building type and its users.	**1**	**1**	
Tra 3	Cyclist Facilities	One credit where evidence provided demonstrates that covered, secure and well-lit cycle storage facilities are provided for all building users. Two credits where, in addition to the above, adequate changing facilities are provided for staff use.	**2**	**1**	
Tra 4	Pedestrian and cycle safety	One credit where evidence provided demonstrates that the site layout has been designed in accordance with best practice to ensure safe and adequate cycle access. One credit where evidence provided demonstrates that the site layout has been designed in accordance with best practice to ensure safe and adequate pedestrian access.	**2**	**0**	
Tra 5	Travel plan	One credit where evidence is provided to demonstrate that a travel plan has been developed and tailored to the specific needs of the building users.	**1**	**1**	
		Indicative Transport (weighted) Section Score	**5.82%**		

Water

Wat 1	Water Consumption	Up to three credits where evidence provided demonstrates that the specification includes taps, urinals, WCs and showers that consume less potable water in use than standard specifications for the same type of fittings.	**3**	**3**	Option 3 - Actual Specification
Wat 2	Water meter	One credit where evidence provided demonstrates that a water meter with a pulsed output will be installed on the mains supply to each building/unit.	**1**	**1**	Option 3 - Actual Specification
Wat 3	Major leak detection	One credit where evidence provided demonstrates that a leak detection system is specified or installed on the building's water supply.	**1**	**0**	
Wat 4	Sanitary supply shut off	One credit where evidence provided demonstrates that proximity detection shut-off is provided to the water supply to all toilet areas.	**1**	**1**	Option 3 - Actual Specification
Wat5	Water recycling	Up to two credits where evidence provided demonstrates the specification of systems that collect, store and, where necessary treat, rainwater or greywater for WC and urinal flushing purposes.	**2**	**1**	Option 3 - Actual Specification
		Indicative Water (weighted) Section Score	**4.50%**		

Materials

Mat 1	Materials Specification (major building elements)	Up to four credits are available, determined by the Green Guide to Specification ratings for the major building elements.	**4**	**3**	
Mat 2	Hard landscaping and boundary protection	One credit where evidence provided demonstrates that at least 80% of the combined area of external hard landscaping and boundary protection specifications achieve an A or A+ rating, as defined by the Green Guide to Specification.	**1**	**0**	

Mat 3	Re-use of building façade	One credit is awarded where evidence provided demonstrates that at least 50% of the total façade (by area) is reused and at least 80% of the reused façade (by mass) comprises in-situ reused material.	1	1	
Mat 4	Re-use of building structure	One credit is awarded where evidence provided demonstrates that a design reuses at least 80% of an existing primary structure and for part refurbishment and part new build, the volume of the reused structure comprises at least 50% of the final structure's volume.	1	1	
Mat 5	Responsible sourcing of materials	Up to 3 credits are available where evidence provided demonstrates that 80% of the assessed materials in the following building elements are responsibly sourced: a. Structural Frame b. Ground floor c. Upper floors (including separating floors) d. Roof e. External walls f. Internal walls g. Foundation/substructure h. Staircase Additionally 100% of any timber must be legally sourced.	3	1	
Mat 6	Insulation	One credit where evidence provided demonstrates that thermal insulation products used in the building have a low embodied impact relative to their thermal properties, determined by the Green Guide to Specification ratings. One credit where evidence provided demonstrates that thermal insulation products used in the building have been responsibly sourced.	2	1	Option 2 - Green Building Guide
Mat 7	Designing For Robustness	One credit where protection is given to vulnerable parts of the building such as areas exposed to high pedestrian traffic, vehicular and trolley movements.	1	0	

Indicative Materials (weighted) Section Score **6.73%**

Waste

Wst 1	Construction Site Waste Management	Up to three credits are available where evidence provided demonstrates that the amount of non-hazardous construction waste (m3/100m2 or tonnes100m2) generated on site by the development is the same as or better than good or best practice levels. One credit where evidence provided demonstrates that a significant majority of non-hazardous construction waste generated by the development will be diverted from landfill and reused or recycled.	4	2	
Wst 2	Recycled aggregates	One credit where evidence provided demonstrates the significant use of recycled or secondary aggregates in 'high-grade' building aggregate uses.	1	0	
Wst 3	Recyclable waste storage	One credit where a central, dedicated space is provided for the storage of the building's recyclable waste streams.	1	1	
Wst 5	Composting	One credit w here evidence provided demonstrates there is a vessel on site for composting food waste, and adequate storage for such waste generated by the building's users and operation. OR Where space or access is limited, there is a dedicated space for compostable food waste to be stored prior to removal and composting at an alternative site.	1	0	

Indicative Waste (weighted) Section Score **3.21%**

Land Use & Ecology

LE1	Re-use of land	One credit where evidence provided demonstrates that the majority of the footprint of the proposed development falls within the boundary of previously developed land.	1	1	
LE2	Contaminated land	One credit is awarded where evidence provided demonstrates that the land used for the new development has, prior to development, been defined as contaminated and where adequate remedial steps have been taken to decontaminate the site prior to construction.	1	0	
LE3	Ecological value of site AND Protection of ecological features	One credit is awarded where evidence provided demonstrates that the construction zone is defined as land of low ecological value and all existing features of ecological value will be fully protected from damage during site preparation and construction works.	1	1	
LE4	Mitigating Ecological impact	One credit where evidence provided demonstrates that the change in the site's existing ecological value, as a result of development, is minimal. Two credits where evidence provided demonstrates that there is no negative change in the site's existing ecological value as a result of development.	2	2	
LE5	Enhancing Site Ecology	One credit where the design team (or client) has appointed a suitably qualified ecologist to advise and report on enhancing and protecting the ecological value of the site; and implemented the professional's recommendations for general enhancement and protection of site ecology. Two credits where, in addition to the above, there is a positive increase in the ecological val of the site of up to (but not including) 6 species. Three credits where, in addition to the above, evidence is provided to demonstrate a positive increase in the ecological value of the site of 6 species or greater.	3	1	
LE6	Long term impact on biodiversity	One credit where the client has committed to achieving the mandatory requirements listed below and at least two of the additional requirements. Two credits where the client has committed to achieving the mandatory requirements listed below and at least four of the additional requirements.	2	0	
	Indicative Land Use & Ecology (weighted) Section Score		**5.00%**		

Pollution

Pol 1	Refrigerant GWP - Building services	One credit where evidence provided demonstrates the use of refrigerants with a global warming potential (GWP) of less than 5 or where there are no refrigerants specified for use in building services.	1	0.5	Option 2 - Green Building Guide
Pol 2	Preventing refrigerant leaks	One credit where evidence provided demonstrates that refrigerant leaks can be detected or where there are no refrigerants specified for the development. One credit where evidence provided demonstrates that the provision of automatic refrigerant pump down is made to a heat exchanger (or dedicated storage tanks) with isolation valves. Or where there are no refrigerants specified for the development.	2	1	Option 2 - Green Building Guide
Pol 4	NOx emissions from heating source	One credit where evidence provided demonstrates that the maximum dry NOx emissions from delivered space heating energy are ≤100 mg/kWh (at 0% excess O2). Twp credits where evidence provided demonstrates that the maximum dry NOx emissions from delivered space heating energy are ≤70 mg/kWh (at 0% excess O2). Three credits where evidence provided demonstrates that the maximum dry NOx emissions from delivered space heating energy are ≤40 mg/kWh (at 0% excess O2).	3	0	Option 2 - Green Building Guide

Pol 5	Flood risk	Two credits where evidence provided demonstrates that the assessed development is located in a zone defined as having a low annual probability of flooding. One credit where evidence provided demonstrates that the assessed development is located in a zone defined as having a medium or high annual probability of flooding AND the ground level of the building, car parking and access is above the design flood level for the site's location. One further credit where evidence provided demonstrates that surface water run-off attenuation measures are specified to minimise the risk of localised flooding, resulting from a loss of flood storage on site due to development.	**3**	**3**	
Pol 6	Minimising watercourse pollution	One credit here evidence provided demonstrates that effective on site treatment such as Sustainable Drainage Systems (SUDs) or oil separators have been specified in areas that are or could be a source of watercourse pollution.	**1**	**1**	
Pol 7	Reduction of Night Time Light Pollution	One credit where evidence provided demonstrates that the external lighting design is in compliance with the guidance in the Institution of Lighting Engineers (ILE) Guidance notes for the reduction of obtrusive light, 2005.	**1**	**0.5**	Option 2 - Green Building Guide
Pol 8	Noise Attenuation	One credit where evidence provided demonstrates that new sources of noise from the development do not give rise to the likelihood of complaints from existing noise-sensitive premises and amenity or wildlife areas that are within the locality of the site.	**1**	**0.5**	Option 2 - Green Building Guide

Indicative Pollution (weighted) Section Score **5.42%**

Innovation - Exemplary Level Criteria

Innovation	Man 2: Considerate Constructors	Where post construction, a Considerate Constructors Scheme certificate can be provided demonstrating that the site achieved CCS Code of Considerate Practice with a score of at least 36. OR Where post construction, the site has complied in full with the alternative, independently assessed scheme, and the alternative scheme addresses all the mandatory and optional items in Checklist A2.	**1**		
Innovation	Hea 1: Daylighting	At least 50% by floor area of the sales and common spaces have point daylight factors of at least 2%.	**1**		
Innovation	Ene 1: Reduction of CO2 emissions	One additional innovation credit can be awarded where evidence provided demonstrates the building is designed to be a carbon neutral building as defined by the NCM (i.e. in terms of building services energy demand), as follows: a. A new building achieves a CO2 index less than 0 on the benchmark scale. b. A refurbished building achieves a CO2 index equal to or less than 0 on the benchmark scale. Two additional innovation credits can be awarded where evidence provided demonstrates the building is designed to be a True zero carbon building (in terms of building services and operational energy demand).	**2**		Option 4 - No evidence
Innovation	Ene 5: Low or Zero Carbon Technologies	A local LZC energy technology has been installed in line with the recommendations of a compliant feasibility study and this method of supply results in a 20% reduction in the building's CO2 emissions.	**1**		