

ENERGY & SUSTAINABILITY STATEMENT

April 2019

127A LOVEROCK ROAD/STADIUM WAY,
READING, RG30 1DZ



Green & Castle Limited
April 2019 (v.3 DRAFT)

www.green-castle.co.uk



TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	2
2. INTRODUCTION	3
3. POLICY.....	4
4. ENERGY AND CO ₂ EMISSIONS	6
5. SITEWIDE CARBON REDUCTION MEASURES.....	9
6. LOW CARBON AND RENEWABLE ENERGY	16
7. SUMMARY.....	19

This report has been prepared in good faith and is based on planning documentation. Whilst the information used is taken from the planning drawings and documentation, the final performance will be dependent on the final commissioning results and actual operation of the building. This document should be used for planning purposes only and should be re-assessed during detailed design. Any building calculations use standard CIBSE data. These do not match the intended 'actual' building usage exactly but allow an approximate 'like for like' analysis. The results presented in this report are therefore not valid for 'real' building operation. Furthermore where costs are included for low carbon or renewable energy technologies they are indicative only and specific detailed costs should be requested from accredited suppliers and installers once the development progresses and further assessments of consumption and supply have been decided.



1. EXECUTIVE SUMMARY

- 1.1. This Sustainability and Energy Statement assesses the proposals against relevant National and Local policy relating to sustainable development and energy efficiency. The report assesses the proposals across the following areas:
- Building Energy Efficiency Measures;
 - Sitewide Carbon Reduction Measures:
 - Water and Flood risk;
 - Waste;
 - Materials;
 - Pollution, and
 - Transport.
- 1.2. The statement recognises the policy imperatives at national and local levels to achieve high standards of sustainability performance, both in terms of the strategic fit of the proposal and the realisation of the development through its design and construction.
- 1.3. The approach underlying the design and construction of the development is to recognise the need for future-proofing, enabling high levels of energy performance and minimised resource use. This will be achieved through:
- A planned reduction in energy consumption and CO₂ emissions to be achieved through a combination of 'passive' and fabric first energy efficiency measures;
 - Materials with the lowest environmental impact possible will be used within the development;
 - Waste and pollution will be minimised and managed throughout construction and operation.
 - Recycling to be encouraged throughout the scheme;
 - Reduced water use will be encouraged throughout;
 - Public transport use will be encouraged along with cycle parking facilities on site.

2. INTRODUCTION

Purpose of this document

- 2.1. This statement is submitted in support of an application for the development at 127A Loverock Road/Stadium Way, Reading.
- 2.2. The statement has been developed to reflect a good practice approach to energy assessment. The content of the assessment seeks to provide a consistent and complementary analysis when taken into account with the planning application and should be read alongside the accompanying plans and reports.

Application Site and Surroundings

- 2.3. The application site is within the long established Stadium Way Industrial Estate which is located to the west of Reading town centre. The application site itself has a total area of 3 844sqm (0.38 hectares).
- 2.4. The applicant also owns the entire Stadium Way Industrial Estate to the west, including the roads within.
- 2.5. The application site is located north of Portman Road and is bounded by the Great Western mainline railway to the north (running on an embankment), Wigmore Lane to the east, existing industrial/warehouse units of Stadium Way to the west and an industrial/warehouse building beyond the southern boundary.
- 2.6. The existing units in the block are planned for demolition. They are currently used for car repair and maintenance and on short term leases.
- 2.7. Beyond the building itself, a large part of the remaining application site is impermeable paving/parking/road. This is generally not used for car parking as the wider Stadium Way Industrial Estate has ample car parking elsewhere.

Proposed Development

- 2.8. The proposed development is for demolition of two existing dilapidated buildings which are subdivided into four units of 586m² total gross external floor area.
- 2.9. These are proposed to be replaced by a new single unit for B1c, B2 and B8 use classes with ancillary offices, including associated service area, car parking and landscaping.
- 2.10. Access onto Wigmore Lane is also to be modified.
- 2.11. The new unit will have a total gross external floor area of 1 758m² of which 207m² will be first Floor ancillary offices.
- 2.12. The unit will largely be single storey and have an internal clear height of 10m in order to meet current occupier requirements for a building of this nature.

3. POLICY

- 3.1. Sustainable development is strongly promoted through international initiatives including the World Summit on Sustainable Development held in Johannesburg, 2003; national initiatives including the UK Government Sustainable Development Strategy (2005); and local initiatives such as Local Agenda 21 (LA21) were developed in response to the Rio Earth Summit (1992).
- 3.2. The principle of sustainable development is embedded throughout national and local planning policy guidance. The following identifies the relevant policy pertinent to the assessment of this development.

National Policy

- 3.3. National planning policy is set out in the 'National Planning Policy Framework' (NPPF). A presumption in favour of sustainable development lies at its heart. Applications that accord with the development plan should be approved without delay. Where there are no relevant policies, permission should be granted unless the impacts of doing so would significantly and demonstrably outweigh the benefits.
- 3.4. The presumption in favour of sustainable development is the golden thread running through the Framework. The Framework explains that there are three dimensions to 'sustainable development': an economic role; a social role; and an environmental role.
- 3.5. For plan making, the presumption requires that local plans must meet objectively assessed needs, and for decision taking it requires that where the development plan is absent, silent or out of date, planning permission should be granted unless adverse impacts would significantly and demonstrably outweigh the benefits, or where policies in the Framework indicate that development should be restricted.
- 3.6. The Framework explains that the Government is committed to securing economic growth to create jobs and prosperity. The planning system should do everything it can to support sustainable economic growth. Planning should operate to encourage and not act as an impediment to sustainable growth. Accordingly, significant weight should be placed on the need to support economic growth through the planning system.
- 3.7. The Framework attaches great importance to the design of the built environment: good design is a key aspect of sustainable development. It is indivisible from good planning, and should contribute positively to making places better for people.

Local Policy

Reading Borough Council Core Strategy Adopted January 2008, Alteration Adopted January 2015.

- 3.8. The Reading Core Strategy has a cross cutting policy for Sustainable Development, and within this are a set of environmental limits. These include using resources efficiently, reducing consumption, minimising pollution and managing risks.



- 3.9. In addition to this Core Strategy Policy **CS1 Sustainable Construction and Design** details some requirements for new development which aim to maximise the use of energy efficiency and energy conservation measures. The policy states a 20% reduction in emissions on a baseline of 2010.
- 3.10. The current policy for energy and carbon has clarified requirements within the **Revised Sustainable Design and Construction Supplementary Planning Document (2011)**. It states that the 20% reduction target is no longer valid as it has been superseded by the update in the Building Regulations 2013.
- 3.11. The Validation Checklist supports the SPD which outlines that a Sustainability Statement should form part of the Energy Statement along with a BREEAM pre-assessment to meet the minimum guidance for the Core Strategy policies listed below:
- CS1 – Sustainable Construction and Design – including daylight, minimising carbon dioxide emissions across the site and energy efficiency measures;
 - CS2 – Waste Minimisation - efficient use of natural resources;
 - CS23 - Sustainable Travel and Travel Plans
 - CS24 - Car/ Cycle Parking;
 - CS34 - Pollution and Water Resources - including noise, air and urban runoff;
 - CS35 - Flooding - avoiding impacts from natural hazards (including flooding);
 - CS36 - Biodiversity and Geology - promoting and protecting biodiversity and green infrastructure.

Summary

- 3.12. As noted above the LPA requires a scheme that is intended to focus on meeting energy conservation and carbon emissions reductions in line with the Reading Borough Council Policy CS1.
- 3.13. This statement will show through a simple methodology based on the categories of sustainable development, how the proposal intends to comply with the necessary sustainability targets.
- 3.14. It also shows with relation to energy and carbon conservation compliance in line with the aspirations of the council the options for a % reduction through efficiency savings and possible renewable energy in line with the BRE assessment standard for carbon reduction BREEAM.

4. ENERGY AND CO₂ EMISSIONS

Calculation Methodology

- 4.1. The following energy sections of this document will follow the basic structure of the energy hierarchy as outlined below:
- Be Lean: reduce the need for and use less energy;
 - Be Clean: supply and use energy efficiently; and
 - Be Green: supply energy from renewable sources.
- 4.2. All energy figures have been calculated using approved software IES-ve 2018.1.0.0, VE Compliance 7.0.10.0., to provide evidence of compliance with the Building Regulations as well as amount of improved carbon emissions for the development.
- 4.3. The carbon emissions factors used in all calculations in this document are those published in Table 2 of Part L2A of the Building Regulations. The relevant factors are reproduced in Table 1 below.

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Natural Gas	0.194
Biomass	0.025
Grid supplied electricity	0.422
Grid displaced electricity	0.568

TABLE 1: Carbon emission factors by fuel type

Energy

- 4.4. This section of the report provides an energy assessment of the key issues associated with sustainable development, and in particular carbon emissions. Table 2 below details the proposal.

Proposed	Class	Floorspace M ²
Single Storey Unit	B1c, B2 and B8	1,758

Table 2: Proposed Floorspace By Use Class

- 4.5. The use of the energy Hierarchy (as below) has been adhered to where effective.
- **Energy Reduction** - Intelligent systems e.g. lighting; programmable and timed heating systems; ensuring compatibility between air conditioning and heating systems.



- **Energy Efficiency** - A rated electrical appliances; enhanced building insulation; inclusion of passive design elements.
- **Renewable Energy** - Heat and electricity generated from renewable sources including solar photovoltaic panels and wind turbines for electricity, and solar thermal for water heating.
- **Low Carbon Energy** - Where energy cannot be generated through renewables, low carbon technologies include ground/air/water source heat pumps.
- **Conventional Energy** - In an optimum development this will not be required.

Energy Baseline

- 4.6. Table 3 below outlines the energy baseline as measured against the 2013 Building Regulations and in line with the BREEAM assessment methodology.

	Energy kWh/yr	Kg/CO ₂ /yr
Site Baseline	52,939	26,900

TABLE 3: Energy Baseline

Energy Efficiency Measures

- 4.7. There are a number of measures available to implement at this stage of the development in order to reduce the energy consumption of the site. These measures will not only save energy and money for the occupants in the long term they will also reduce the amount of renewable energy required on site which can have significant reductions in the build costs of the development.
- 4.8. The overarching strategy to implement energy efficiency at Stadium Way is based upon:
- Reducing energy consumption where possible through effective building design; and
 - Incorporating efficient low carbon technologies where applicable and viable.
- 4.9. In accordance with policy CS1 design innovations will be introduced to reduce the reliance on energy consumption by maximising natural daylighting, and lighting controls.
- 4.10. The building envelope will meet the minimum thermal insulation requirements of the current Building Regulations Part L and where possible will exceed them with the goal of limiting heat loss and improving air tightness through an improved envelope.
- 4.11. The following list illustrates some of measures that will be considered at the design stage to improve the energy efficiency of the development and to achieve energy efficiency savings:
- HVAC Initiatives including controlled “air quality” sensors for both the supply and extract air systems. These reduce the energy requirement from the main HVAC system and can work in conjunction with roof vents, and the other mechanical services;

- Energy Metering: Smart energy metering can be used to raise awareness of energy use and enable tracking of 'out of range' values;
- Increased air tightness: improvement in constructability to less than 8kPa to reduce heat loss again resulting in less heating and cooling necessary;
- Improved U-values for key building elements;
- Lighting levels will be an integration of dimmable, zoned and PIR activated systems minimise energy use in unoccupied areas;
- Photo cells to automatically turn off lighting in areas where daylight levels are sufficient;
- Shading: provision of natural shading methods such as trees and brise soleil to minimise glare and heat gain;
- Building orientation to take advantage of solar gain where appropriate.

4.12. The table below shows the predicted savings in emissions from these measures which amount to approximately 3% of the predicted site total.

	Energy kWh/yr	Kg/CO ₂ /yr
Site Baseline	52,939	26,900
Energy Efficiency Savings (Lean)		807

TABLE 4: Energy Savings Improvement over the Building Regulations

5. SITEWIDE CARBON REDUCTION MEASURES

- 5.1. Carbon reduction will be gained from the inclusion of any of the energy efficiency measures listed in section 4. Further carbon reduction opportunities will come from the following site wide measures:

Water

- 5.2. Designing for environmental performance is highlighted as important in the design of new development in the **NPPF Section 15 Conserving and enhancing the natural environment and also in the Core Strategy Policy CS1**. This includes adopting proactive strategies to mitigate and adapt to climate change including flood risk and water supply.
- 5.3. Rain falling on buildings and hard surfaces often needs to be drained artificially in order to prevent problems of localised flooding. Despite the implications on quality, ecology and amenity traditionally the method of dealing with surface water has been to pipe it away from developments and discharge it to the sewerage system or nearby watercourses.
- 5.4. Sustainable drainage aims to imitate a more natural drainage process by delaying discharges and allowing rainfall to soak into the ground, thus reducing both the volume and rate of surface water run-off to sewers and watercourses.
- 5.5. Sustainable measures can include swales, reed beds, soft planting and permeable surfaces which all slow run-off and so contribute to ground water recharge and reduced risk of flooding.

Floodrisk

- 5.6. A Flood Risk Assessment (FRA) accompanies this submission and in summary notes the following:
- 5.7. Flood risk to the proposed development from various sources, including rivers, sewers, groundwater, ditches and overland flow has been considered in this study. Flood risk from rivers is considered to be high (Flood Zone 3), and flood risk from overland flow is considered to be moderate. Flood risk from all other sources is considered to be low.
- 5.8. **Flood Risk Mitigation Measures** in the form of flood resilient construction measures are to be used in the construction of the proposed industrial building. A Flood Warning and Evacuation Plan has been prepared for the proposed development. The future site owners will be required to sign up to the EA's Flood Warning Service.
- 5.9. **A Surface Water Drainage Strategy** in order to mitigate flood risk posed by post development runoff, adequate on site control measures will be required. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere. Further details can be found in the accompanying FRA.

- 5.10. Runoff from the post development site will be collected and discharged to an attenuation tank located beneath the proposed car park at the southern end of the site. The proposed discharge rate represents significant betterment over the current unattenuated discharge rate from the site.
- 5.11. All attenuation facilities will be designed to accommodate and dispose of runoff from storms up to the 1:100 year + 40% climate change event, without flooding.

Water Efficiency

- 5.12. Construction impacts. The key water uses during the development construction phase include the following:
- General dust and on site roads suppression, and wheel washes;
 - Hydro-demolition with high pressure water;
 - Wash out of ready mixed concrete wagons;
 - Site and general cleaning;
 - Specialist and high pressure cleaning;
 - Commissioning plant and services.
- 5.13. As part of the Considerate Constructors Scheme the contractors will be expected to monitor their water usage and minimise the waste where possible thus improving efficiency.
- 5.14. It is envisaged that the buildings would incorporate some or all of the follow measures to reduce water consumption:
- Low flow taps and showers;
 - Low/dual flush WCs;
 - Use of water meters throughout the development;
 - Rainwater harvesting to reduce run-off in high intensity rainfall events;
 - Use of landscaping as integral part of the application site to break up hard surfaces to reduce surface water run-off, including:
 - Integration of indigenous landscape species which remove the need for irrigation alongside rainwater harvesting should water be required during summer months.
 - Drought tolerant turf and plant species Landscaping can be designed to minimise water consumption without detriment to the appearance of a scheme
- 5.15. Incorporation of these features allows a reduction in the demand for water from the development, and in the surface water run-off.

Waste

- 5.16. **The National Planning Policy for Waste (October 2014)** seeks to reduce waste in all forms of development from the construction and operational phases.
- 5.17. The waste management objectives and initiatives for the site will be aligned to the Government's Waste Strategy. These measures include the movement of waste up the waste hierarchy and diverting waste from landfill, both during construction and operation.
- 5.18. It is intended that the following measures will be incorporated to reduce waste and manage resources throughout construction and operation:
- Accreditation to Considerate Constructors scheme;
 - Appointment of team member to monitor commissioning on behalf of the client to ensure commissioning will be carried out in line with current best practice;
 - Creation of dedicated bin stores to promote recycling throughout the operational phase; and
 - Preparation of Site Waste Management Plan. The SWMP will seek to incorporate final reporting of waste management performance (with respect to recycled and secondary materials, waste reduction, segregation, recovery and disposal) and cost savings identified.
- 5.19. In order to facilitate recycling, the site layout is designed to ensure that adequate space can be allocated to accommodate waste and recyclable materials generated on the site.
- 5.20. Once operational, it is anticipated that the building tenants will develop a comprehensive waste management policy; identifying anticipated waste streams and implementing a strategy for separation, storage and collection by a waste contractor so to minimise volumes of waste to landfill.
- 5.21. Taking these steps promotes waste minimisation in accordance with the waste hierarchy set out in the National Planning Policy for Waste.

Materials

- 5.22. Materials will be sourced from certified environmentally responsible sources with preference for the engagement of manufacturers and suppliers who can demonstrate their environmental credentials through recognised certification schemes such as BES6001 and ISO14001.
- 5.23. Where possible, materials which achieve high ratings in the BRE's Green Guide to Specification will be included.
- 5.24. Where available local and recycled sources will be utilised to reduce pressure on virgin resources and limit the environmental impact associated with materials transport.
- 5.25. Timber and wood-derived products will be encouraged to have Forest Stewardship Council (FSC) Chain of Custody certification, or be sourced from independently verifiable legal and sustainable sources.



- 5.26. Re-use of onsite materials where feasible to limit necessity of virgin materials being brought to site. This also limits waste leaving site and associated pollution.
- 5.27. Other considerations in the materials selection process for the site include:
- Low dependence on ozone depleting materials;
 - Cost effective selection of sizes;
 - Just in time product ordering to minimise wastage;
 - Non toxic materials and finishes for users and occupants;
 - Materials with potential for re-use/recycling at end of life.

Pollution

- 5.28. Materials for the purposes of thermal and acoustic insulating will have a global warming potential of less than 5. This standard will apply to both the manufacture and installation in the key building elements of:
- Roofs
 - Walls
 - Floors
 - Hot water cylinders
 - Cold water storage tanks
 - External doors
- 5.29. Nitrogen oxide (NO_x) emissions from the operation of the heating and hot water systems across the development will also be controlled and will aim to be as low as possible with levels below 100 mg/kWh.

Noise

- 5.30. It is considered unlikely that the operation of the proposed development would impact significantly on the existing noise 'character' of the area.
- 5.31. The site is currently operational and is located in an established industrial/warehousing area. Furthermore the nearest residential properties to the south have both a building and some trees to deaden any noise.
- 5.32. The new building layout has been carefully considered and is oriented so as to shield the service area from the houses. It will also act as a buffer to railway noise from trains which run at high level along the embankment.

- 5.33. As such the subjective impacts of any noise generated by operations within the proposed development site are likely to be reduced by a masking effect of the habituation and the existing noise climate.

Air

- 5.34. The construction and operational phases of development and their impact on local air quality will be managed by the developer as laid out in the necessary pre-construction documentation with mitigation measures being put in place where necessary. As the site is currently occupied by multiple premises and users it is not felt that air pollution during the construction phase will prove detrimental to nearby occupants.

Ground

- 5.35. As stated in the air emissions section above during construction, the contractor will implement measures to ensure good standards of site management to minimise pollution risk to ground, air and water, safeguard the local environment and minimise disturbance and nuisance to neighbouring properties.

Light

- 5.36. Any external lighting will be specified in compliance with ILE Guidance Notes for the Reduction of Obtrusive Light, and CIBSE Lighting Guide 6: The Outdoor Environment.
- 5.37. Any specified lighting will also be bat friendly in line with guidance.
- 5.38. This will create a well-lit, safe environment where site users can feel confident of their safety and security at all hours of day, whilst also minimising light pollution which could impact on neighbouring developments.

Transport

- 5.39. Since 1990, greenhouse gas emissions from domestic transport have increased by 12% and now represent 21% of total UK domestic emissions. Of this, domestic road transport is by far the biggest emitter at around 92%¹
- 5.40. The location of the application site reflects the requirements of the NPPF and local policy in ensuring that patterns of growth make the fullest possible use of walking, cycling and public transport, and focus significant development in locations which are sustainable.
- 5.41. The location of the site provides a realistic choice in travel modes to cater for a number of daily journeys which would act to reduce employees' reliance on the private car. Further details of the transport can be found in the accompanying Transport Statement.

Public Transport

¹ Source: National Atmospheric Emissions Inventory (IPCC categories)

- 5.42. There are a number of bus stops are located within a few minutes walk of the development site on both sides of Oxford Road. A total of 6 services; (15, 16, 17 143, F21 B63) are available to users.
- 5.43. Services operate to places such as, Calcott (IKEA), Norcot, Purley, Tilehurst and Reading Centre, where further options are available to the North and East of the Town Centre.

Rail Services

- 5.44. Reading West railway station is located approximately 1.2 miles from the site and trains to Reading, Basingstoke and Newbury.
- 5.45. Reading Central Station is 2 miles away and is on the main London line to the east and Southampton, Bournemouth and Didcot to the South/West.

Car Parking Spaces

- 5.46. The car park makes provision for 23 parking spaces including 2 disabled.

Cycling

- 5.47. Cycle parking is detailed in the accompanying Transport Statement and amounts to a supply of 7 spaces across the site. Cycle parking spaces will be located within an accessible, lit, covered and secure storage area either internally or externally on the building perimeter.

Walking

- 5.48. There are a number and a range of shops, convenience stores and cafes serving Loverock Road/Stadium Way within 10 minutes walking distance of the site.
- 5.49. Also within walking distance of the proposed development site is Kensington Park some 20 minutes walk from the site. It contains a pavilion, football pitch, basketball court, recreation area and outdoor gym equipment.
- 5.50. The Thames Path and Reading Town Centre are a 30 minute walk away.

Summary

- 5.51. The site offers connections to a comprehensive network of existing pedestrian / cycle infrastructure providing access to nearby bus stops and residential areas.
- 5.52. The site will be accessed via a reconstructed kerbed bellmouth on Wigmore Lane.
- 5.53. The site will provide 23 car parking spaces which will offer sufficient capacity to absorb projected parking demand, noting that provision is in excess of the standards specified by Reading Borough Council for 'General Industrial' and 'Light Industrial' uses.
- 5.54. The site will provide 7 cycle parking spaces to accord with the Reading Borough Council Parking Standards and Design SPD (2011).

- 5.55. Deliveries and servicing will take place on site with vehicles able to enter and exit the site in a forward gear as demonstrated by swept path analysis.
- 5.56. Comparative analysis between the trip generational characteristics of the existing B2 / B8 use and the proposed B1 / B2 / B8 uses identifies that the proposed development has the potential to generate a net increase of 7 and 6 two-way vehicle movements during the AM peak and PM peak periods respectively.
- 5.57. It is therefore concluded that the proposed development will have a negligible impact on the operation of the surrounding highway network.
- 5.58. Compliance with relevant Local and Central Government Policy Guidelines in terms of being in a suitable location, and accessible by modes other than the private car are considered to be met.

6. LOW CARBON AND RENEWABLE ENERGY

- 6.1. An assessment of the various technologies was performed to understand their commercial and carbon benefits at Loverock Road/Stadium Way. Certain technologies are only suitable for certain applications, which will provide an input into the plan. The viability of each technology to be used is scored against a traffic light system to focus attention on where greatest benefits can be gained:

Red – not viable

Amber –potentially viable in the future

Green – viable

Renewable Technology	Description	Design Constraints	Application	Indicative costs	Emission Reduction Potential	Viability at site
Small Scale Wind Turbines	Produce electricity by using the natural power of the wind to drive a generator capable of 6kW to 50kW	Small scale turbines require clear access to wind flow and wind speeds need to be at least 6m/s. Urban areas are not ideal.	Can be installed on the development site. Wind speeds at the development will be variable	Medium capital costs with long paybacks.	Average – offsets electricity which has a high CO ₂ content. Wind speeds may not produce large amount of electricity.	Would not be appropriate for energy demand of site, or location in relation to nearby residences.
Large scale wind turbines	Produce electricity by using the wind to drive a generator capable of 250kW to 5MW	Large structures up to 100m in height need to be away from housing and in areas of high average wind speeds.	Limited location within the development site. Requires sufficient consistent average wind speed.	High – wind turbines can cost significantly	High – potentially a large producer of electricity	Built up, urban location precludes favourable inclusion.
Photovoltaics (PVs)	Modules of semi conductor cells convert daylight into electricity. Generate approx 850 kWh/yr for a 1kWp System	Southerly orientation necessary for optimum performance.	Can form part of the roof or wall structure	High – efficiencies and costs have fallen but still very expensive.	High – potentially a large producer of electricity	May be cost prohibitive for development. Structural stability of roof critical feature.
Solar water heating	Energy from the sun heats fluid in a collector, which heats water. Can generate on 550kWh/m ² /yr	Southerly orientation best for optimum performance and a good hot water demand.	Can form part of the roof structure, sized to meet a proportion of the hot water demand.	Low – additional equipment required minimal and can be easily installed	Limited to the amount of hot water stored. Lower CO ₂ reductions than electricity offsetting technologies.	Insufficient demand as single technology.



Biomass heating	Utilises energy from boilers or local district scheme	Connection to existing grid network to access district heating scheme	Biomass boilers can be used commercially for district heating	Medium – removes the need for a gas supply in some cases. Cost to connect to the grid can be expensive	High – low carbon fuel used	Potential to utilise the energy for heating & hot water on site. Unwanted NOx issue for residents.
Gas Combined Heat and Power	CHP generates electric & thermal energy in a single system. Gas CHP converts natural gas into usable energy (e.g., steam and electricity).	Needs to serve a high electrical and heat demand all year round. Running hours of over 6,000 are desirable.	Due to the nature of the scheme, CHP will need to be available to each unit.	Medium – cost savings can be considerable if the system operates for most of the year.	High – using natural gas as the fuel input results in large amounts of electricity and heat produced and high emission savings	Most suitable when buildings have high electrical and gas usage patterns.
Biomass CHP	As above biomass CHP uses organic matter directly from plants or indirectly from industrial, commercial, domestic or agricultural products	Needs to serve a high electrical and heat demand all year round. Running hours of over 6,000 are desirable. Storage space limited.	Can be applied to district heating schemes on a commercial level	High – biomass CHP is relatively new and based on large systems. Fuel supply is more complex	High – fuel input is normally low carbon and produces heat and electricity efficiently	Technology is not used widely. Fuel storage availability on site may be limited. NOx issue for residents.
Ground source heat pump (GSHP)	Ground source heat pumps transfer heat from the ground into a building to provide space heating or to pre-heat hot water.	Either requires vertical boreholes or a large horizontal area. Ground conditions may affect viability.	Can serve the site providing winter heating	Medium – ground works can be costly and savings determined by unit prices. High electricity prices affect payback.	Medium to High – requires electricity to run the heat pump but does produce emission savings. Electricity supply could be renewable.	Use limited to space heating. Insufficient space on site for trenching.
Air Source Heat Pump (ASHP)	Air source heat pumps recover heat from the air to provide water and/or space heating. Some also use exhaust and ambient air.	ASHP's are less efficient than ground source, and likely to be more variable because air temperatures fluctuate more.	Can serve the site providing heating and/or ventilation	Medium/Low – Requires large area within constrained site. High electricity prices affect payback.	Medium to High – requires electricity to run the heat pump.	Less viable due to large area which would be required for heat pumps, and possible noise of combined units.

Low and zero carbon solutions

- 6.2. At this stage of the design it is not clear which of the potentially applicable technology's in the table will be most suited to the energy needs of the development whilst not impacting heavily on the visual appearance or streetscene.
- 6.3. A south facing development is the optimal orientation for the most suitable solar technologies, and further work will continue to be carried out in order to detail these impacts and gain agreement from the LPA on a best fit solution as the proposal moves forwards. As can be seen from the table above not all technologies are suitable for the site conditions or capable of meeting the site demand. Further details of potentially viable technologies can be seen below.

PV

- 6.4. Photovoltaic panels are most efficient when incorporated onto the roofs or southerly aspects of building. They provide electricity through inverters placed close to the panels and are connected to the three way phased electricity incoming main supply to the building. The renewable energy will become the primary feed, with grid energy as back-up.
- 6.5. PV panels cost in the region of £3,000 per kilowatt peak (kWp) and generate 850kW.
- 6.6. PV works on the basis that daylight is converted into electricity and mainly comes in the form of panels, so can therefore be integrated on to a building with relative ease. The main design consideration, which effects overall output, is the orientation of the panels. The optimum orientation is due south at an angle of between 20 and 40 degrees.
- 6.7. Energy generated but not used can be stored in batteries for use at a later time or exported to the national grid to provide revenue.



Solar hot water

- 6.8. Solar thermal systems provide hot water which can be used for the hot water supply and space heating principally suitable for dwellings, but can also be beneficial where there are constant water demands such as in warehouses and offices.
- 6.9. Solar hot water collectors can provide up to 60% of the annual hot water demand of a building and cost in the region of £2,500 per 4m² flat plate solar thermal collector system.
- 6.10. Solar thermal systems rely on a solar collector connected to a hot water cylinder. For solar thermal systems to work on this development they would need to be located on a southerly facing roof area with an optimum pitch of between 20 and 40 degrees. Each solar thermal system would require a twin coil hot water cylinder instead of a conventional single coil cylinder.



Flat plate



Evacuated tubes

7. SUMMARY

- 7.1. The principle of development is synonymous with the NPPF which seeks to promote the efficient reuse of land and buildings. The development proposals will replace vacant buildings in need of investment and repair as part of comprehensive plans for the improvement of the site.
- 7.2. With regard to **energy**, the scheme will meet current Building Regulations requirements with regard to energy and resource efficiency and it is intended that the following measures will be included to improve savings:
- Increased insulation and air tightness;
 - Using controlled supply and extract air systems;
 - Energy metering systems;
 - Dimmable, zoned and PIR activated lighting systems; and
 - Shading: provision.
- 7.3. **Water efficiency** measures including Low flow sanitary facilities, water meters and careful landscaping are planned.
- 7.4. **Waste** will be dealt with both at the construction phase and throughout occupation with well planned and integrated facilities to aid user interaction.
- 7.5. **Materials** will be of least impact where viable and the reuse of materials is a design consideration.
- 7.6. **Pollutants** of all types will be controlled and minimised where possible both during construction and operation of the scheme.
- 7.7. **Transport** services are ideally placed to benefit the site, from excellent accessibility to bus services along Oxford Road, to rail services from Reading West to Central London. The site has further opportunities to reduce private car use by being located a few walk from the shops, a park, bowling green and rose garden.
- 7.8. **Low carbon and Renewable Energy** has been assessed against the BREEAM methodology and a range of renewable and low carbon technologies have been considered for inclusion.

Conclusion

- 7.9. The council requires a scheme that is intended to focus on meeting energy conservation and carbon emissions reductions in line with the Building Regulations and where possible providing a proportion of the site energy demands from on-site renewables.
- 7.10. This statement has shown how through a wide range of approaches, the development complies with the energy and carbon conservation along with wider sustainable measures in line with the aspirations of both the Core Strategy policies and wider council aspirations.

