



The PES

Energy & Sustainability Statement

12th May 2025

**Hadwyn House
Field Road
Reading
RG1 6AP**

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Contents

1	Executive Summary	2
2	Site, Proposal & Planning Policy	3
3	Baseline Energy Demand	6
4	Design for Energy Efficiency "Be Lean"	7
5	Supplying Energy Efficiently "Be Clean"	10
6	Renewable Energy Options "Be Green"	12
7	Sustainable Design and Construction	17
8	Conclusions	21

1.0 Executive Summary

The proposed development project at Hadwyn House involves the development of an upward extension to create an additional floor of employment space.

It has been designed to achieve highest of environmental performance standards following the guidance within Reading's Sustainable Design and Construction Supplementary Planning Document (December 2019) in order to meet the requirements of Reading's newly adopted Local Plan policies.

A 'Lean, Clean, Green' approach to assessing energy and thermal comfort needs and appropriate solutions has been adopted following the guidance within the energy hierarchy and the development is expected to achieve an overall improvement (BER/TER) in regulated emissions of **>25%**, through the adoption of high standards of insulation, efficient heat pump driven heating and cooling systems, natural ventilation and roof a mounted PV array.

2.0 The Site & Proposal

Hadwyn House is an existing 2 storey office block located on the western side of Field Road.

The proposals under consideration within this report is for the development of a new 2nd floor mansard construction to deliver additional employment space.

2.1 Local Planning Context

2.1 Planning Policy

The project is within the Reading Borough Council; Readings new local plan was adopted in November 2019 and key policies relevant to this Energy Statement are:-

CC3: ADAPTATION TO CLIMATE CHANGE

All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development:

- Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;
- Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc;
- Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and
- All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change

CC4: DECENTRALISED ENERGY

In meeting the sustainability requirements of this plan, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source.

Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

Where there is existing decentralised energy provision present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential development of 1,000 sq m or more will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.

Reading also adopted their Sustainable Design and Construction Supplementary Planning Document in December 2019. This document confirms the requirement for Sustainability Statements and Energy Statements for Major Schemes

Energy Statements demonstrate how the energy related aspects of the proposed development actually meets the requirements of local planning policy and BREEAM energy and emissions standards. An energy statement would typically include the following information:

- Energy efficiency of the building;
- Baseline annual predicted energy demand of the development (regulated and unregulated);
- Baseline annual predicted carbon emissions of the development (regulated and unregulated), the Target Emission Rate (TER);
- The contribution of each proposed renewable energy technology;
- Cost information of technically feasible low or zero carbon renewable technologies, including additional insulation, low carbon decentralised energy, heat pumps etc;
- Feasibility of district or community heating;
- Summary of the benefits of various energy technologies;
- The total estimated reduction in the development's baseline carbon and/or energy emissions.

The SPD also summarises the planning submission requirements for

- A pre-assessment estimator incorporating a 5% buffer and provision of other appropriate information to provide confidence to the LPA that policy requirements can be achieved;
- Sustainability Statement for all major development;
- Energy Statement for all major development.

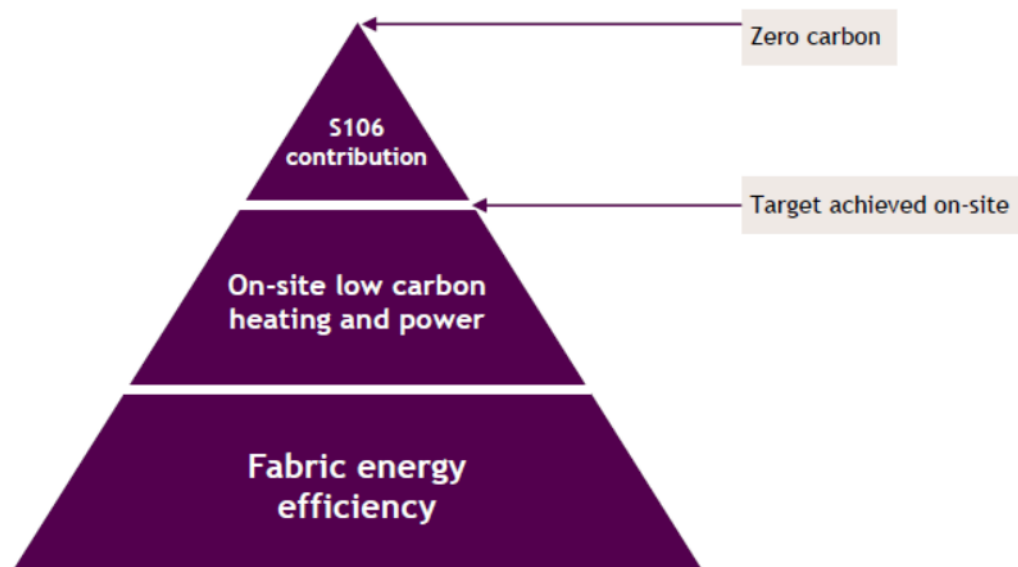
2.2 The Energy Hierarchy

As noted above, this report will consider the project against the principles of the energy hierarchy commonly in use across London Boroughs; 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 or district energy networks) and supply energy efficiently and cleanly.
- 3) Be green: generate, store and use renewable energy on-site.

See Figure 4.1 taken from Reading's Sustainable Design and Construction Supplementary Planning Document:-

Figure 4.1



3.0 Baseline energy results

The first stage of the 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 Commercial Space

The refurbishment and extension of 6-8 Market Place involves the addition of new floor space to the rear and street front commercial blocks and roof top extensions.

The energy requirements for space heating, water heating and ventilation within the new build retail space have been calculated using the National Calculation Method (NCM) in line with AD L2A of the Building Regulations 2013 and the Non-Domestic Heating Compliance Guide.

The Government approved assessment methodology is the Simplified Building Energy Model (SBEM), eb7 Sustainability Ltd use an advanced modelling software - Design Builder - which enables accurate SBEM models to be created, as well as heat loss and cooling load calculations and full M&E design to be undertaken.

To consider the subject building performance against The Building Regulations (Approved Document L2A) SBEM first creates the notional reference building, the characteristics of which are defined within NCM and the minimum fabric values and fixed services efficiencies set down by AD L2A and the Non-domestic Compliance Guide.

In order to establish the baseline, the HVAC solution has been assumed as a low temperature hot water serving fan coil units, via centralised gas fired boilers and natural ventilation. Domestic Hot Water (DHW) will be supplied from the same boilers via appropriately sized calorifiers and a secondary circulation loop.

This creates the Target Emission Rate (TER) and should be considered as stage 'zero' of the energy hierarchy as described earlier and sets the benchmark for the worst performing, but legally permissible, development against which, SBEM assesses the "actual" design, fabric values, heating lighting and ventilation systems and creates the Building Emissions Rate (BER).

4.0 Design for energy efficiency

The first step in the 'Energy Hierarchy' requires 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 CO₂ produced by the building after the energy efficiency measures have been included. From these figures the overall reduction in CO₂ 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

Local and London Plan policy requires designers to introduce measures to control heat gain and deliver passive cooling.

It is further explained that; "the NPPF 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.

Accordingly, careful consideration of this issue has been undertaken as part of the application for renewal. The applicants will seek to follow the guidance within CIBSE Guide A and KS03 – Sustainable Low Energy Cooling; An Overview in order, where practical and feasible, to deliver a passive cooling strategy.

Clearly, there are limitations to passive design options when extending an existing building, however the matter has been considered as below;

- Hadwyn House is located in a low rise suburb of Reading, and the top floor extension will not be able to benefit from any local topographical shading.
- The host building has a existing east/west orientation, proving the distinct advantage of avoiding the peak southern sun.
- The new structure is a lightweight mansard style structure, which will offer the ability to highly insulate the new structure.

- The design is also able advantage of the existing heavyweight roof slab structure to assist in the regulation of heat within the internal spaces.
- Fenestration is kept to the optimum – offering significant internal daylight, whilst avoiding excessive solar gain.
- The glazing for windows and roof lights will have a low g-value and internal blind will offer further sola control.
- The narrow open plan floor plate enable a highly functional cross ventilation strategy, assisted by opening rooflights.
- This enables perimeter lighting to be daylight controlled and thus make significant energy saving on lighting circuits.
- The use of low energy LED lighting will be significant in reducing internal heat gains.
- Low energy office equipment will also be selected in order to limit internal gains.

4.1.3 Services

The design team and proposing to maintain a natural ventilation strategy for the project.

The new structure will be tested for air tightness, seeking to achieve a $5\text{m}^3/\text{hr}/\text{m}^2$ to further enhance the efficient use of energy in the space

The design team have confirmed that the use of air source heating to provide heating and cooling,, the justification for which will be confirmed as this report progresses through the Energy Hierarchy.

Finally, a low energy lighting system – utilising linear surface mounted or suspended direct/indirect, LED luminaires in all newly created rooms and other occupied areas - controlled via reactive lighting switches and absence detectors - will ensure a/ minimal internal gains, b/ low energy consumption and c/ much reduced running costs.

4.2 Heating System

The “notional” heating system considered under the “be lean – use less energy” section of the Energy Hierarchy for the conversion will consist of heat pump driven heating and cooling.

Domestic hot water will be provided by point of use systems – the most efficient solution in spaces with limited demand

To increase the efficiency in the use of the HVAC systems, the following controls will be used to eliminate needless cycling of the heat pumps.

- BMS systems enabling load compensation and delayed start thermostats.

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 mansard wall constructions will be a highly insulated lightweight frame and will target a U-Value of 0.20W/m²k or better.
- The new roofs will be insulated to meet a U-Value of 0.14W/m²k or better.

Air Tightness

- The new office spaces will be air tested to rating at circa 5m³/hr/m²,

Glazing

- New double glazing is to achieve a u value at 1.4W/m²k, with a g value at 0.40.

4.4 Ventilation

As noted above, the proposals will include a natural ventilation strategy via opening windows, enhanced via the cross ventilation potential.

4.5 Lighting and appliances

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

Common/circulation areas will also have an absence detection system to ensure lights cannot be left on when not in occupation.

The project will further reduce unregulated energy use via the selection of energy efficiency white goods and energy star rated TVs and PC equipment.

4.6 Energy efficiency results

The above passive design and energy efficiency measures are expected to result in a reduction in CO₂ emissions as assessed under AD Part L2 from the development by a minimum of **15%**.

5.0 Supplying Energy Efficiently

The second stage in the '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.

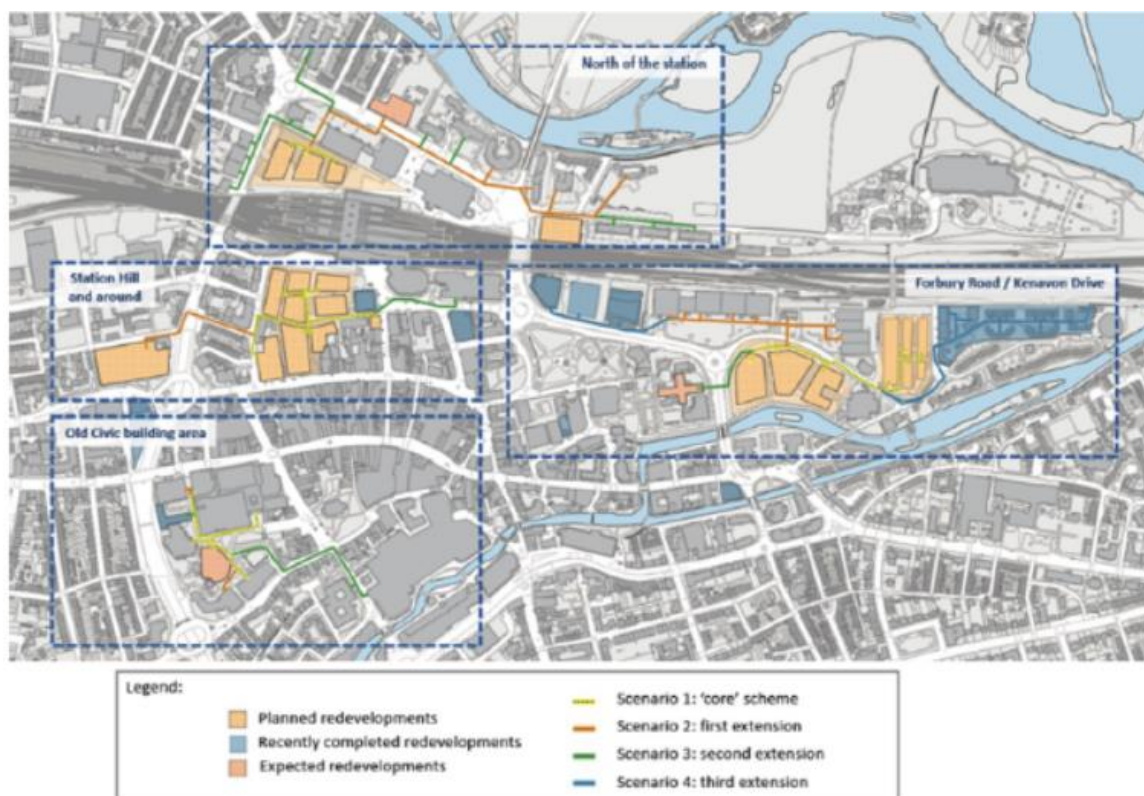
Policy CC4 of Reading's Local Plan deals with decentralised energy, and expects non-residential development of over 1,000m² to consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

It also expects non-residential development of 1,000m² or more to link into an existing district energy network, where one is present within the vicinity of an application site, or demonstrate why this is not feasible.

The current HVAC proposals for the Market Place development are already assuming centralised plant to services all area; therefore, this report must consider the availability – now or in the future – of heat networks in the Reading Town Centre area.

Element Energy was commissioned by Reading to undertake a heat mapping and energy master planning study for Reading town centre. The number of anticipated redevelopment sites and existing density of domestic and non-domestic energy uses present an opportunity to establish heat network schemes.

Based on heat mapping and constraints analysis, the following four clusters were identified as potentially suitable for heat network schemes:



A detailed technical and economic assessment identified several potentially deliverable heat network scheme options centred on the four clusters as identified in the above map.

Almost all scheme options in all four clusters were found to be viable, some with additional financial support and some without; all four clusters are entering detailed feasibility analysis.

It can be seen that the project site at Field Road is beyond the reach of the identified clusters and to bring any form of DEN connection specifically to the Hadwyn House development will be financially non-viable.

6.0 Renewable Energy Options

The final element of the '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 sun's 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.

It should be noted, that when using SAP10.2 emission factors, each kWh of gas energy saved reduces emissions by 0.21kgCO₂/kWh, whereas, grid based electrical energy has a emissions factor of 0.136kgCO₂/kWh but a much higher cost – some 3.5 that of gas - and accordingly, emphasis will be placed upon "off-setting" grid based electricity in order to achieve the optimum use of renewable technologies, albeit, it should be noted that the emissions reduction impact of renewable technologies actually generating electricity will be considerably reduced.

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 Smart Export Guarantee (SEG)

Introduced in 2020, the SEG will enable solar photovoltaic (PV), wind, hydro and anaerobic digestion (AD) installations up to 5MW and micro-combined heat and power (micro-CHP) up to 50kW will be able to receive an export tariff under the policy.

The SEG is a market-led initiative, requiring electricity supply licensees to offer export tariffs to eligible generators. Suppliers are free to set their own SEG compliant tariff price (provided it is above zero pence at all times) and decide how their tariffs work.

Installation owners are able to shop around and select the Licensee of their choice based upon an offer of the most appropriate tariff.

Payment are made against metered exports only.

6.1.2 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally withdrawn for non-domestic application in March 2021.

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 proposed development is bordered by residential accommodation of similar height in all directions. To overcome these potential 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 Hadwyn House itself.

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

6.3 Solar Energy

The host building has areas of flat roofed areas - that could accommodate solar panels orientated to the south.

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 m² of unshaded UK roof surface annually. The usable energy output per m² 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 or high efficiency heat pumps for DHW provision; accordingly solar thermal systems tend to have a very poor pay back model.

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.

Despite the withdrawal of the Feed in Tariff, PV panels also offer an attractive return due to the ever increasing cost of grid based electricity.

Accordingly, an 10 panel/4.4kWp PV array is to be accommodated at the top floor flat roof level - generating some 4,000kWh per annum.

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.

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 now expected within major conurbations.

The use of biomass is dismissed.

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

Clearly, there is no opportunity to install the required ground collectors, 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.

Given the requirement to future proof the development against future overheating potential, the design team are considering the use of variable refrigerant (VRF) flow air-to-air heating and cooling system which incorporates inter-zone heat recovery.

VRF systems can have numerous indoor units, served by a single outdoor unit, in both heating and cooling modes simultaneously. This mixed mode operation leads to energy savings as both ends of the thermodynamic cycle are delivering useful heat exchange. If a system has a cooling COP (Coefficient of Performance) of 3, and a heating COP of 4, then heat recovery operation could yield a COP as high as 7.



VRF typical layout

It should be noted that this perfect balance of heating and cooling demand is unlikely to occur for many hours each year, but whenever mixed mode is used energy is saved. In mixed mode the energy consumption is dictated by the larger demand, heating or cooling, and the lesser demand, cooling or heating is delivered free.

Accordingly, the design team are proposing the use of VRF heating and cooling to services the new top floor employment space.

This approach will obviate the need to utilise the fossil fuels, and in keeping with this strategy, DHW will also be provided by electrical only systems – local point of use heaters..

6.9 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use of VRF heat pump technology, to provide the required heating and cooling to the new top floor spaces.

A roof mounted 4.4kWp PV array will finalise the renewables mix.

Considering the regulated emissions controlled under AD Part L2, then the final reduction in BER/TER is expected to exceed **25%**.

7.0 Sustainable Design & Construction

The sustainable assessment criteria as developed by BRE are utilised within this report to confirm that the development meets with the requirements of the Lambeth's sustainability policies

7.1 Energy efficiency; vacant & underused land and buildings

For matters of Passive Design, Solar gain control & daylighting, Ventilation, Thermal Performance, Services Strategy, Low or zero carbon technologies and overall Energy Performance, all these matters have been dealt within the Local Plan compliant Energy Statement within Sections 2 to 6 above.

Clearly, the re-use of the existing buildings is highly sustainable by default delivering longevity and flexibility with much reduced embodied carbon costs

7.2 Materials

The design team have put a strong focus on sustainability and durability when considering construction profiles and building materials for the development. High Green Guide ratings will be achieved wherever possible and materials will be assessed for suitability with regards to Whole Life Costs, which given the use of a retained building, is expected to perform extremely well.

Clearly, the reuse of the existing building - to be extended to enhance useability and thereby, longevity – is clearly, highly sustainable by default.

The principal issue when considering the environmental impact of new construction materials is the embodied carbon – i.e. the carbon cost extraction of raw material, transport to factory, manufacturing, transport to site and erection on site.

Additional carbon costs are occurred through maintenance and repairs as well as end of life (deconstruction/demolition)

The design team will seek out construction techniques with a lower embodied carbon contents; light weight recyclable steel partitioning and plasterboard and insulation materials with high recycled content.

In addition to the above low carbon strategy, the development will source all materials from supplier that can demonstrate that materials are sourced responsibly in line with recognised Environmental Management Systems (FCS, BES6001 etc.)

Insulating materials will be specified to maximise thermal performance whilst still paying attention to the environmental impact of the materials used. The use of recycled products will be pursued wherever feasible and the use of other low embodied energy products will be further investigated.

Non-toxic materials will be used wherever possible, including the specification of products with low VOC content in line with European testing standards.

A Site Waste Management Plan (SWMP) will be produced for the site, which will determine how to maximise the recovery of materials from the enabling works for subsequent high-grade/value applications.

7.3 Air pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies for dust pollution by using dust sheets, covering skips and damping down where appropriate.

Plant and machinery

All plant and equipment installed in the building will be appropriately sized and selected for efficiency in order to reduce greenhouse gas emissions. All equipment will be frequently maintained to ensure it continues to run efficiently and cleanly.

Operational impacts

The use of heat pump technology for all heating/cooling systems and domestic hot water systems, confirms that the project will have a neutral impact on local air quality.

Noting the above all electrical HVAC solution and car free proposals confirm the project's air quality neutrality as per the Mayor's guidance.

7.4 Noise pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies to minimise noise pollution, including the use of quieter machinery where possible. Site working hours will be managed to mitigate the possibility that they will cause a nuisance to the surrounding properties.

Noise impact of the building

The development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings.

All external plant and potential noise impacts of the new ventilation and heat pump plant in operation will be assessed, attenuated and reported upon accordingly.

7.5 Contaminated land

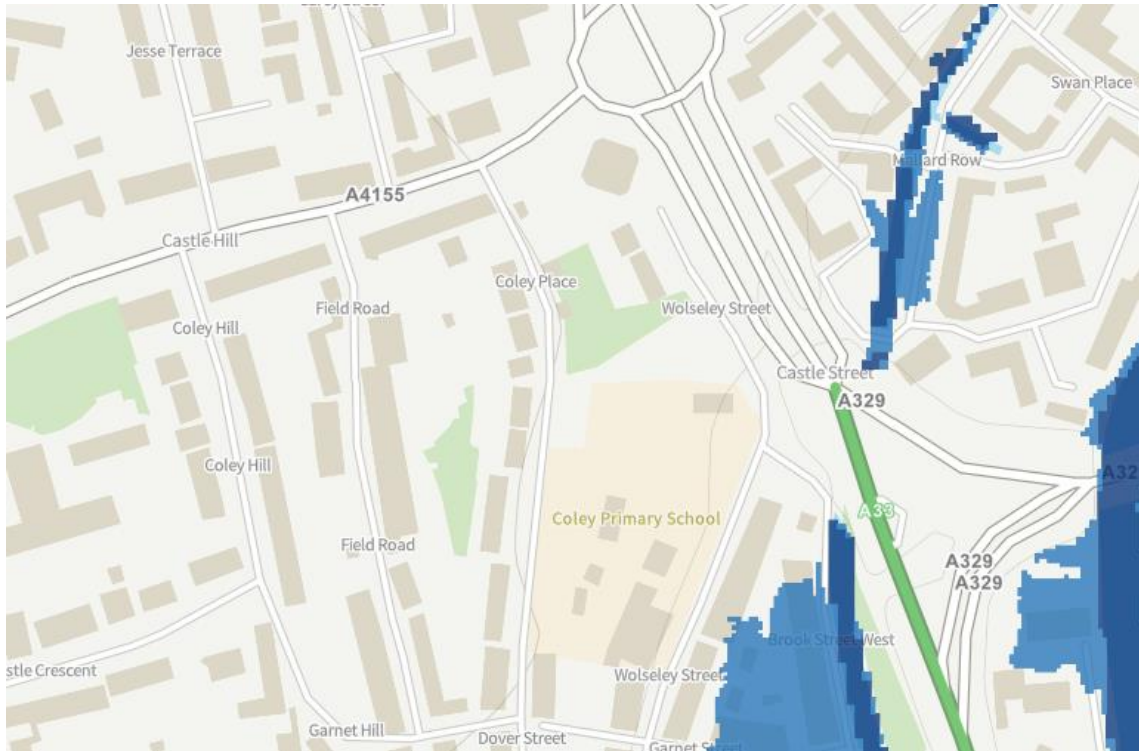
It is not thought that the site is contaminated.

The proposed building use will not involve the storage, processing or transfer of hazardous substances.

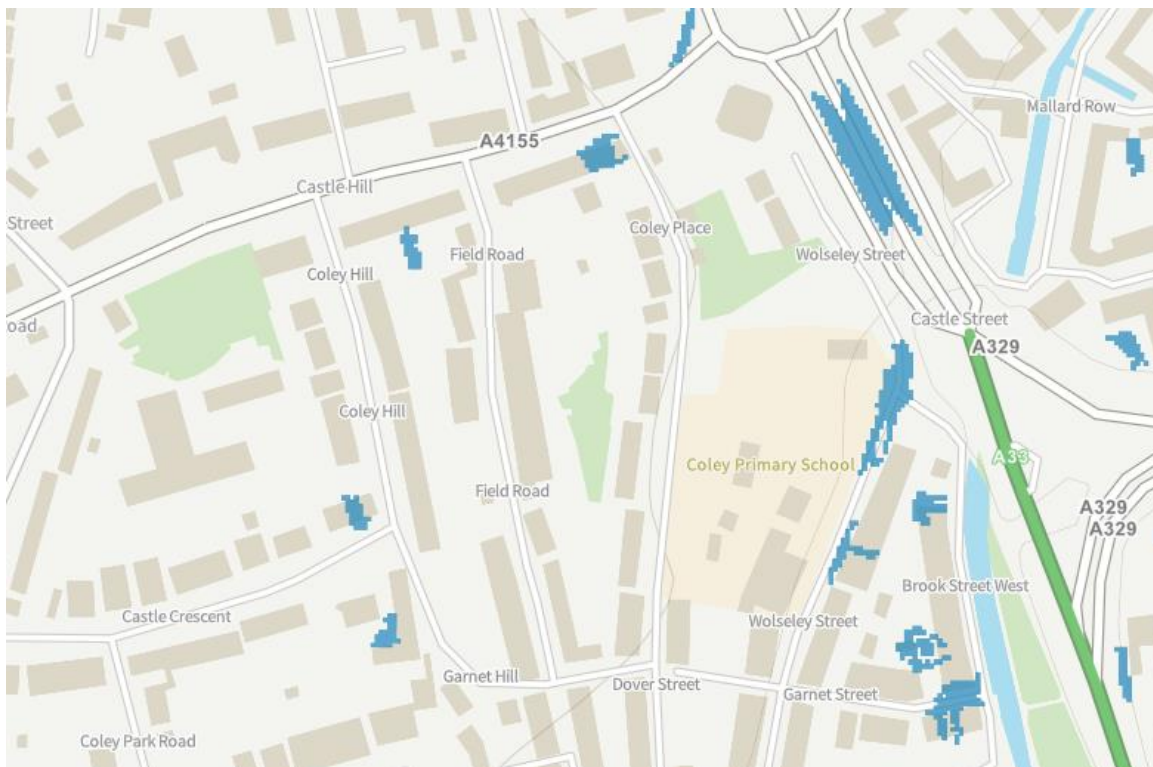
7.6 Water quality, saving and drainage

Flood risk and surface water drainage

The Project is in an area of very low risk from flooding – sea, river or surface water:-



EA – Flood Risk



EA – Surface water

Water consumption

Internal potable water use will be limited through the specification of low flow fittings and dual flush toilets.

The following specifications will be considered in order to meet the low water consumption target:

- Basin Taps – 4.5l/min
- WCs – 5/2.6 litre flush

Construction site impacts

The construction site will be managed in such a way that the environmental impact is controlled and minimised. Best practice guidelines for preventing water pollution will be followed on site.

8.1.8 Light pollution

Any external lighting will be designed in accordance with the ILE guidance so as not contribute to increasing the effects of light pollution.

8.1.9 Waste and recycling

Site waste management

A construction site resource management plan will be developed and implemented to ensure that construction site waste is effectively reduced and recycled, including designing waste out from the initial stages. Material ordering control and modern construction methods will be employed to minimise the potential for waste on site.

Waste will either be segregated on site into at least 5 different streams for recycling or collected, sorted and recycled by an external recycling contractor. Re-use of construction waste will also be encouraged. The site waste management plan will also ensure that hazardous waste is properly managed.

It is a clear target of the development to divert over 97% of the project construction waste away from landfill.

Operational waste management

The recycling of operational waste once the building is occupied will also be encouraged through the provision of recycling facilities and dedicated internal and external storage for recyclable materials, separate to those for domestic refuse.

8.0 Conclusions

This report has detailed the baseline energy requirements for the proposed extension development at Hadwyn House, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO₂ reductions using renewable energy technologies.

Throughout the assessment against the energy hierarchy – as set out in appropriate planning guidance – SAP10.2 emissions data has been used in line with the latest building regulations.

Following the introduction of passive energy efficiency measures into the development, as detailed in section 4, the total amount of CO₂ emissions would be reduced by circa 15%.

There is also a requirement to reduce CO₂ 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 CO₂ emissions would be via the use of VRF heat pump technology to service the heat and cooling loads, as well as a 4.4kWp PV array at top floor roof level.

It is expected that the new extension would achieve achieves an overall improvement in emissions over the Building Regulations Part L standards for regulated emissions of minimum of **25%**.

The extension will also meet with the sustainable construction techniques and issues as highlighted under Section 7.0 above and thus will accord with Local Plan policy CC3 and the associated sustainable construction guidance.