

Boundoak Works, Arborfield

Energy and Sustainability Statement

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RECORD OF REVISIONS		
Date.	Revision.	Description of change.
06/09/2024	001	First Issue
20/09/2024	002	Updated results

1. EXECUTIVE SUMMARY

This report considers the energy and sustainability measures to be incorporated within the proposed development of Boundoak Works, Arborfield. This document reviews the requirements at both a national and local level, as set out in the National Planning Policy Framework, and Wokingham Borough council.

This updated energy report supersedes the previous report by Aardvark EM Limited for the originally approved scheme which housed the energy centre within unit 1.

The current revised proposals approved through a S73 application are now for a smaller scheme than that originally approved, and the energy generation proposed uses more contemporary and efficient technology, providing a greener and more sustainable solution.

The previous energy centre housed in part of unit 1 was based on a gas fired system, whilst the current proposals are based on fully renewable energy sources, through the use of solar PV panels and air source heat pumps. This not only provides the benefits of greener more sustainable energy generation but also occupies less space. The previous energy centre was located in part of unit 1, taking up usable floor area, whereas the current proposals are for a roof mounted solar array freeing up building floor area for the intended employment use.

This current energy proposal is therefore an improvement on the previous strategy from both a sustainable energy generation and practical viewpoint.

Also, it should be noted the construction of an energy centre would add a significant amount of embodied carbon to the project compared to the proposed all electric solution as detailed within this energy strategy.

The recommended sustainability features for the development, resulting from a dynamic energy model, will allow for an **16.41%** of energy savings, and a total carbon reduction of **13.66%** through the incorporation of Air source heat pump (ASHP), photovoltaic panels, and passive energy efficiency measures. These measures will allow the development to be compliant with the local planning requirements set out by the Wokingham borough council.

The energy and carbon savings are to be achieved through passive design, energy efficient measures incorporating design features such as energy efficient lighting, submetering of relevant areas, upgrading of 'U' values and occupancy sensing in relative areas, as well as the incorporation of ASHP system and a **73.20 kWp** of Photovoltaic Array. The proposed development achieves an EPC A rating. To reduce the energy demand of the development as well as help to conserve water resources within the local area, it is anticipated that the fit-out works will provide for sanitary fittings which will be water efficient through measures such as dual flush toilets and low flow taps

The development is located next to the Eversley Road A327, and as such is in proximity to a range of primary local amenities, as well as being in walking distance of public transportation systems.

The incorporation of these sustainability measures allows for the proposed development to be deemed sustainable and shall be in accordance with local and national policy.

The total baseline energy and carbon emissions for the development (built to Part L 2021), taking into account regulated energy demands are:

- **62,895.61 kWh/annum**
- **9.65 Tonnes CO₂/annum**

After the inclusion of the Passive and on-site renewable technologies, the total baseline energy and carbon emissions for the development, taking into account regulated energy demands have further reduced to:

- **52,576.15 kWh/annum**
- **8.33 Tonnes CO₂/annum**

2. INTRODUCTION

This report has been prepared by Cudd Bentley Consulting Ltd, to investigate the aspects of energy and sustainability surrounding the proposed development of Boundoak Works, Arborfield.

Government policies now require significant energy reductions from proposed buildings. Building a greener future sets a planned trajectory outlined via Part L 2021 of the Building Regulations. These commitments have been the key focus point in addressing policies and strategies to reduce energy use and carbon emissions through energy efficiency and low or zero carbon technologies (LZC).

The recommended strategy takes into consideration the site layout and requirements for the building to produce a design that incorporates the most appropriate technologies available to the site that are commercially viable, whilst targeting compliance with all policies applicable to this development.

The proposed development of 9 industrial units is located next to the Eversley Road A327, in Arborfield. Figure 2.1 below shows the site plan for the development.

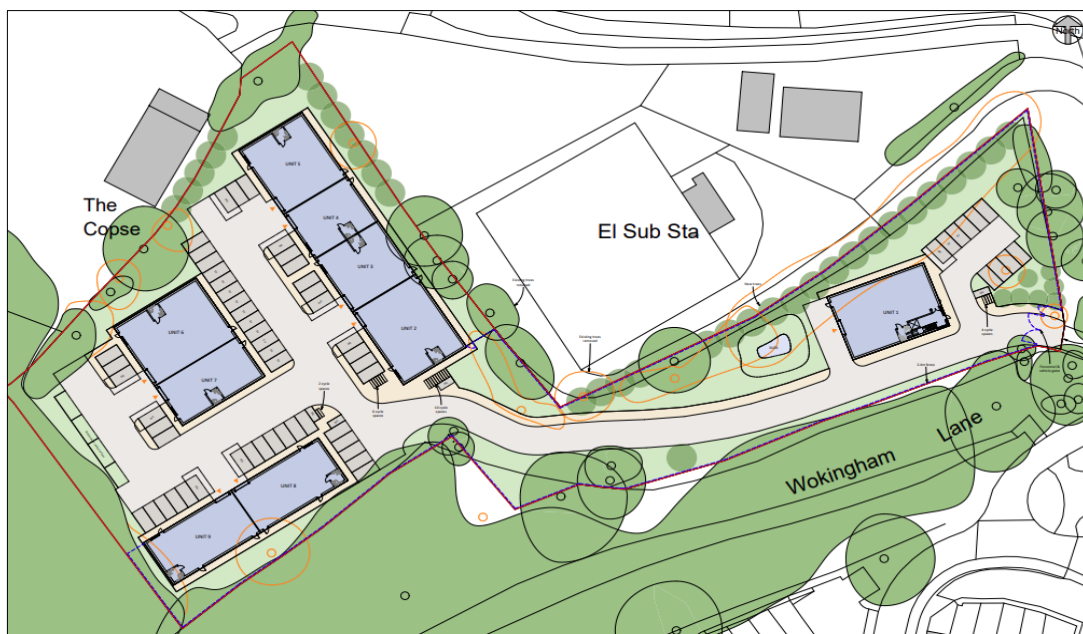


Figure 2.1: Proposed Site Plan

3. DRIVERS OF SUSTAINABILITY

The term Sustainable Development, is defined by the Department for the Environment, Food and Rural Affairs as:

‘... making sure people throughout the world can satisfy their basic needs now, while making sure that future generations can also look forward to the same quality of life. It recognises that the “three pillars” – economy, society and environment – are interconnected.’



To achieve this objective of sustainable development in any industry, sector strict regulations have been put in place that have filtered down through EU Directives from the European Climate Change Programme, to National UK Acts such as the Climate Change Act 2008, to Local Policy in the form of Core Strategies. However, there

are larger drivers behind the concept of sustainable development.

Kyoto Protocol

In 1997, the Kyoto Protocol was adopted as part of the United Nations Framework Convention on Climate Change, to which the UK is a signatory. The key feature of the protocol was the binding targets that were set for industrialised countries to reduce their Green House Gas emissions by 12.5% below 1990 levels by 2008-2012.

Cancun Agreements

Since the initial adoption of the Kyoto Protocol, extensive research has been put forward as to the causes and markers of climate change from the Intergovernmental Panel on Climate Change, which has led to new targets and objectives being made. In 2012, the international community met to discuss new directions for responding to climate change by adopting new agreements. The key objectives of the Cancun Agreements are:

- *Establish clear objectives for reducing human-generated greenhouse gas emissions over time to keep the global average temperature rise below two degrees;*
- *Mobilise the development and transfer of clean technology to boost efforts to address climate change, getting it to the right place at the right time and for the best effect;*
- *Assist the particularly vulnerable people in the world to adapt to the inevitable impacts of climate change;*
- *Protect the world's forests, which are a major repository of carbon;*
- *Establish effective institutions and systems which will ensure these objectives are implemented successfully.*

COP21: Paris Global Climate Agreement

In December 2015, a global climate deal was reached in a summit involving all of the world's nations. The targets of this aimed principally to curb the dangerous levels of climate change and drive an increase low-carbon infrastructure investment. Numerous organisations and corporations also committed to helping create a greener future by making their own pledges through the course of the summit. The key elements of the agreement are:

- *To keep global temperatures "well below" 2.0°C above pre-industrial times and "endeavour to limit" them even more, to 1.5C*
- *To limit the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally, beginning at some point between 2050 and 2100*
- *To review each country's contribution to cutting emissions every five years so they scale up to the challenge*
- *For rich countries to help poorer nations by providing "climate finance" to adapt to climate change and switch to renewable energy.*

BRE's COP21 Climate Pledge (December 2015)

"We commit to continue to drive best practice and carbon reduction, as we have through the use of BREEAM for the past 25 years. By reaching over 9,000 BREEAM rated buildings we predict emissions savings will be in excess of 900,000 tonnes of CO₂, compared to regulatory minimum performance requirements, by 2020. Saving not only carbon, but bringing wider benefits to both the owner and occupiers."

4. NATIONAL POLICY

National Planning Policy

An effective planning system is required to contribute to achieving sustainable development. The **National Planning Policy Framework** (NPPF), 2023, outlines what the government deems as sustainable development in England.

Sustainable development is defined as having the following three overarching objectives which are interdependent and need to be pursued in mutually supportive ways: an economic objective, a social objective, and an environmental objective.

1. Economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
2. Social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
3. Environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

The above objectives can be described as an energy trilemma, this is demonstrated in Figure 4.1 below. Each dimension is dependent on each other and sustainable development proposals should adhere to each role. This energy statement shall ensure the proposed Development is one that contributes economically, socially and environmentally in accordance with the NPPF, 2023.

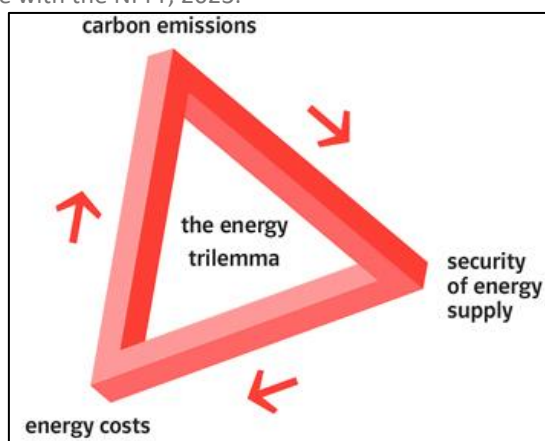


Figure 4.1 The Energy Trilemma

Guidance has been followed from the (NPPF), 2023, to provide an energy strategy which reduces energy use and carbon emissions, in line with best practice. This will provide a balanced scheme which focuses on optimal use of non-renewable resources (energy efficiency measures) whilst providing a renewable energy strategy best suited to the sites and their building uses. Below are some key extracts relevant to the development from Chapter fourteen 'Meeting the Challenge of Climate Change, Flooding & Coastal Change':

Paragraph 158

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

Paragraph 159

New development should be planned for in ways that:

- a. avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- b. can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Paragraph 160

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- a. provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- b. consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- c. identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for locating potential heat customers and suppliers.

Paragraph 161

Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

Paragraph 162

In determining planning applications, local planning authorities should expect new development to:

- a. comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- b. take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Paragraph 163

When determining planning applications for renewable and low carbon development, local planning authorities should:

- a. not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- b. approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Paragraph 164

In determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

5. LOCAL POLICY

This section confirms guidance available and the minimum requirements at local level via Wokingham Borough Council, which states the spatial strategy and policies for the future development of the area.

5.1. WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC03: Green Infrastructure, Trees and Landscaping

1. Green Routes and Green Route Enhancement Areas are defined on the Policies Map.
2. Development proposals should demonstrate how they have considered and achieved the following criteria within scheme proposals:
 - a. Provide new or protect and enhance the Borough's Green Infrastructure networks, including the need to mitigate potential impacts of new development
 - b. Promote accessibility, linkages and permeability between and within existing green corridors including public rights of way such as footpaths, cycleways and bridleways
 - c. Promote the integration of the scheme with any adjoining public open space or countryside
 - d. Protect and retain existing trees, hedges and other landscape features
 - e. e) Incorporate high quality, ideally, native planting and landscaping as an integral part of the scheme.
3. Development proposals which would result in the loss, fragmentation or isolation of areas of green infrastructure will not be acceptable.
4. Development proposals within the River Valley areas shall improve or contribute toward:
 - a. The establishment of a Loddon/ Blackwater riverside footpath and bridleway, as defined on the Policies Map, to accommodate dual use
 - b. The establishment of a riverside footpath and cycleway to accommodate dual use along the Emm Brook
 - c. Opportunities for improvements to green infrastructure to help minimise flood risk.

Policy CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

1. In respect of all new homes:
 - a) Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;
 - b) Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).
2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
 - a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
 - b) Meet or exceed statutory requirements for water resource management.
3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

Policy CC05: Renewable energy and decentralised energy networks

1. Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged
2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:
 - a. Schemes of more than 10 dwellings (gross), or
 - b. Non-residential proposals of more than 1,000 sq m gross floorspace.
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
 - a. They are appropriate in scale, location and technology type;

- b. Are compatible with the surrounding area, including the impact of noise and odour;
- c. Do not have a damaging impact on the local topography and landscape;
- d. There is no significant impact upon heritage assets, including views important to their setting;
- e. In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity Discharge to a foul water or combined sewer is unacceptable.

Policy CC06: Noise

1. Proposals must demonstrate how they have addressed noise impacts to protect noise sensitive receptors (both existing and proposed) from noise impacts in line with Appendix 1 of the MDD.
2. Noise impact of the development must be assessed. Where there is no adverse impact (No Observed Effect Level) then noise will not be a material consideration.
3. Where there is an adverse effect (Lowest Observed Adverse Effect Level to Significant Observed Adverse Effect Level), then
 - a. The development layout must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.
 - b. Where there is still an adverse impact then internal layout must be reviewed. Where this results in there no longer being an adverse impact then design and measures should be incorporated accordingly.
 - c. Where there is still an adverse impact then physical mitigation measures such as barriers/mechanical ventilation must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.
 - d. Where there is still an adverse impact and the development falls within the significant observed adverse effect level then planning permission will normally be refused.

Policy CC07: Parking

1. Planning permission will only be granted where the proposal demonstrates the following:
 - a. How the proposed parking provision meets the standards set out in Appendix 2 of the MDD
 - b. That the new scheme retains an appropriate overall level of off-street parking.

Policy CC08: Safeguarding alignments of the Strategic Transport Network & Road Infrastructure

Routes required for the improvement of the Strategic Transport Network and for other transport related schemes indicated on the Policies Map or listed in Appendix 3 of the MDD will be protected and safeguarded. Proposals for development which would compromise the implementation of these routes would not be supported.

Policy CC09: Development and Flood Risk (from all sources)

1. All sources of flood risk, including historic flooding, must be taken into account at all stages and to the appropriate degree at all levels in the planning application process to avoid inappropriate development in areas at risk of flooding. Proposals must be consistent with the guidance in paragraphs 99-104 of the National Planning Policy Framework (NPPF); the Technical Guidance to the NPPF and demonstrate how they have used the Strategic Flood Risk Assessment (SFRA) to determine the suitability of the proposal.
2. Development proposals in Flood Zones 2 or 3 must take into account the vulnerability of proposed development.
3. Development must be guided to areas of lowest flood risk by applying the sequential approach taking into account flooding from all sources and shall ensure flood risk is not worsened for the application site and elsewhere, and ideally that betterment of existing conditions is achieved. The sequential test will not be required if at least one of the following applies:

- a. Replacement of an existing single residential property. However, the replacement property should, where possible, be located on the part of the site at lowest risk
 - b. Conversions and change of use unless it involves a change to a more vulnerable class
 - c. Minor development, as defined in footnote 10 of the Technical Guidance Note to the NPPF.
4. In exceptional circumstances, new development in areas of flood risk will be supported where it can be demonstrated that:
 - a. The development provides wider sustainability benefits to the community that outweigh flood risk
 - b. The development will:
 - i. Be safe for its lifetime, taking account of the vulnerability of its users
 - ii. Not increase flood risk in any form elsewhere and, where possible, will reduce flood risk overall
 - iii. Incorporate flood resilient and resistant measures into the design
 - a. Appropriate evacuation and flood response procedures are in place to manage the residual risk associated with an extreme flood event.
5. Where required, suitable and appropriately detailed flood risk information will need to accompany a planning application. A Flood Risk Assessment (FRA) is required for:
 - a. All proposals in areas of known historic flooding from all sources
 - b. Where there is evidence of a risk from all sources of flooding identified in the Strategic Flood Risk Assessment
 - c. Those proposals set out in footnote 20 to paragraph 103 of the NPPF.

Policy TB24: Designated Heritage Assets (Listed Buildings, Historic Parks and Gardens, Scheduled Ancient Monuments and Conservation Areas)

1. Historic Parks and Gardens, Scheduled Monuments and Conservation Areas are shown on the Policies Map.
2. The Borough Council will conserve and seek the enhancement of designated heritage assets in the Borough and their settings by:
 - a. Requiring works to or affecting heritage assets or their setting to demonstrate that the proposals would at least conserve and, where possible enhance the important character and special architectural or historic interest of the building, Conservation Area, monument or park and garden including its setting and views.
 - b. Supporting development proposals or other initiatives that will conserve and, where possible, enhance the local character, setting, management and historic significance of designated heritage assets, with particular support for initiatives that would improve any assets that are recognised as being in poor condition or at risk.
3. Proposals for building works shall retain or incorporate existing features or details of historic or architectural significance or design quality into the scheme.

5.2. ADOPTED CORE STRATEGY DEVELOPMENT PLAN (JANUARY 2010)

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

1. Maintain or enhance the high quality of the environment;
2. Minimise the emission of pollutants into the wider environment;
3. Limit any adverse effects on water quality (including ground water);
4. Ensure the provision of adequate drainage; 5) Minimise the consumption and use of resources and provide for recycling;
5. Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;
6. Avoid areas of best and most versatile agricultural land;
7. Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;
8. Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);
9. Provide attractive, functional, accessible, safe, secure and adaptable schemes;
10. Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and
11. Contribute towards the goal of reaching zero-carbon developments as soon as possible by:
 - a. Including appropriate on-site renewable energy features; and
 - b. Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

6. ENERGY AND CARBON EMISSIONS

Government policies require significant energy reductions from buildings. Building a Greener Future sets a planned trajectory (delivered via Part L of the building regulations 2021) with an aspiration for all non-domestic new buildings to be zero carbon by 2020. The Climate Change Act (Nov 2008) sets the UK targets of; CO₂ reduction of 26% by 2020 and CO₂ reduction of 100% by 2050. policy review

6.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 14 – Meeting the Challenge of Climate Change, Flooding and Coastal Change

To help increase the use and supply of renewable and low carbon energy and heat, plans should;

- a. provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- b. consider identifying suitable areas for renewable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- c. identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC05: Renewable energy and decentralised energy networks

1. Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged
2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:
 - a. Schemes of more than 10 dwellings (gross), or
 - b. Non-residential proposals of more than 1,000 sq m gross floorspace.
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
 - a. They are appropriate in scale, location and technology type;
 - b. Are compatible with the surrounding area, including the impact of noise and odour;
 - c. Do not have a damaging impact on the local topography and landscape;
 - d. There is no significant impact upon heritage assets, including views important to their setting;
 - e. In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity Discharge to a foul water or combined sewer is unacceptable.

ADOPTED CORE STRATEGY DEVELOPMENT PLAN (JANUARY 2010)

CP1 – Sustainable development

11. Contribute towards the goal of reaching zero-carbon developments as soon as possible by:
 - a. Including appropriate on-site renewable energy features; and
 - b. Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

6.2. DEVELOPMENT SUSTAINABILITY FEATURES

Energy modelling has been undertaken which adopts the following hierarchy for reducing carbon emissions for the development; Be Lean, Be Clean, Be Green.

The total baseline energy and carbon emissions for the development (built to Part L 2021), taking into account regulated energy demands are:

- **62,895.61 kWh/annum**
- **9.65 Tonnes CO₂/annum**

The primary energy demands of the development will be:

- *Lighting;*
- *General power;*
- *Heating and ventilation;*
- *Cooling*
- *Hot water supply.*

Unregulated energy use is not covered by existing regulations and includes energy consumed by the occupants through activities and appliances; in this case it would typically be small power usage (appliances, computers etc.). The following unregulated energy use for the development was calculated:

- **22,653.47 kWh/annum**
- **3.55 Tonnes CO₂/annum**

Be Lean

To provide energy and carbon saving further to a base Part L (2021) build; targeting compliance with local and national policies, the following passive design and energy efficiency measures are recommended.

The following 'U' values shall be incorporated within the development, in accordance with Part L (2021):

- *External Walls* - $U = 0.22 \text{ W/m}^2.\text{K};$
- *Exposed Floors* - $U = 0.18 \text{ W/m}^2.\text{K};$
- *Exposed Roofs* - $U = 0.15 \text{ W/m}^2.\text{K};$
- *Glazing* - $U = 1.2 \text{ W/m}^2.\text{K};$ (with a G-value of 0.36)
- *Rooflights* - $U = 1.2 \text{ W/m}^2.\text{K};$
- *Personnel Door* - $U = 1.6 \text{ W/m}^2.\text{K};$
- *Vehicle Door* - $U = 1.3 \text{ W/m}^2.\text{K};$
- *Air Permeability* - $3 \text{ m}^3/\text{hr}/\text{m}^2 @ 50 \text{ Pa}.$

Together with the above passive design measures, the proposed energy strategy includes the following energy efficiency measures throughout the development:

- *The provision of energy efficient lighting (PIR controls and occupancy sensing in relevant areas);*
- *The provision of zonal thermal and lighting controls;*
- *The provision of variable speed pumps and fans;*
- *The enhancement of pipework and ductwork, thermal insulation;*
- *Specific Fan Powers improved beyond Part L requirements.*

BOUND OAK WORKS, ARBORFIELD

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Be Clean

It was investigated to establish if there were any existing decentralised energy networks near the proposed site using the Department of Energy and Climate Change CHP database. It has been concluded that there are no suitable existing nearby CHP systems to which a connection may be possible.

In order to economically justify installing a CHP unit on any site, a minimum requirement of 4,000 hours running time per year is necessary. Based on the building types being of class C2, there is a low heating and hot water demand for a continuous period over the year, typically a maximum of circa 2,117 hours is anticipated.

Months	Load per Day (hrs)	Load per week (hrs)	Load per month (hrs)	Load for 6 months (hrs)	
April to Sept	2	14	58.8	352.8	
October to March	10	70	294	1,764.0	
Total approximate Load for a year				2,116.8	hours
Minimum required hours				4,000.0	hours

Table 6.1 CHP Analysis

Be Green

Further means of reducing energy and carbon emissions for the development have been explored, through the use of renewable technologies. The following, Table 6.2, reviews the primary options for generation of on-site renewable/ Low or Zero Carbon (LZC) energy and considers their suitability for use on the development.

Renewable Technology Feasibility Assessment		Viable?
Bio Fuel Boilers 	Bio-fuel boilers are specifically designed to burn solid biomass or liquid bio-fuel in order to heat water, or raise steam. This can then be used for space heating or Domestic Hot Water (DHW) supply. Bio-fuel boilers could potentially provide the annual space heating and DHW demand for the Unit, however they are not recommended for this development for the following reasons:- 1. Biomass boilers generate increased Oxides of Nitrogen (NOx) and particulates (PM10) which would affect air quality. 2. The storage requirements for the biofuel would require a large plant space, with an auxiliary storage facility to allow for a two week period where delivery of fuel might not be available.	No
<u>Land Use</u> Large volumes of storage is required for fuel at ground level or basement level with sufficient vehicular access for fuel delivered. <u>Noise</u> Noise levels are generated by the operation of the bio-fuel boiler and associated deliveries of the bio-fuel. The plant room enclosure will have to be attenuated to acceptable levels imposed by planning and Acoustician recommendations.		

Renewable Technology Feasibility Assessment		Viable?
Wind Turbines 	Wind turbines convert the kinetic energy in the wind into mechanical energy which is then converted into electricity. Wind turbines can provide electrical power either directly to a load or via a battery system. The use of wind turbines is not recommended for this development for the following reasons:- 1. Wind turbines, of a size necessary to make a contribution to the Unit renewable energy requirements are considered inappropriate on spatial, planning, aesthetic and noise grounds. Noise pollution from commercial wind turbines can be quite significant within a few hundred metres. 2. The site is not ideal; an ideal site is a hill with a flat, clear exposure. It should be free from strong turbulence and obstructions like large trees, houses or other buildings. As the development is surrounded by industrial buildings, turbulent wind flow will be experienced across the site which is not ideal for wind turbine installations. 3. The financial viability of a small scale installation on the site would be compromised by the operational efficiency of the unit (circa 30%). 4. Wind turbines, can cause electrical interference within a 2km radius. 5. Finally, the main disadvantage is down to the winds unreliability factor. The wind strength is often too low in many areas, where this site is located the wind speed is 4.4 m/s at 10m, as can be seen in the wind map presented in Appendix C, in order for the wind turbines to be feasible, wind speeds of greater than 5.5m/s are required.	No
<u>Land Use</u> There would be an adverse visual impact on the site which will be dependent on the height at which the wind turbines are located. <u>Noise</u> Noise levels are generated by the rotating blades; these noise levels will vary dependent on wind velocity and will need to be in acceptable levels imposed by planning and Acoustician recommendations.		
Ground Source Heat Pumps 	Space cooling and heating can be provided by circulating water cooled or heated directly by the ground or via subterranean water. Ground water cooling and heating through the use of aquifers makes use of the relatively stable ground/ water temperature which is available at a temperature range of 10 – 14°C. The use of Ground Source Heat Pumps is not recommended for this development for the following reasons:- 1. Cost of boreholes may be prohibitive (subject to site geological conditions). 2. Favourable ground conditions may not exist. 3. Problems can arise with boreholes silting up (open-loop).	No

Renewable Technology Feasibility Assessment		Viable?
	4. Changes in local ground conditions could affect water quality and the amount that can be extracted (open-loop).	No
<u>Land Use</u> This installation would require Environmental Agency approval. Ground and Hydrology analysis would be required to investigate if favourable conditions exist. <u>Noise</u> There are no noise issues generated by this technology.		
Solar Water Heating 	Solar Water Heating systems use radiant energy from the sun to heat water. Systems comprise of a roof mounted heat collector piped to a coil located within a hot water storage cylinder.	
<u>Land Use</u> Roof space is better served for the installation of Photovoltaic panels. <u>Noise</u> Noise levels are generated by pumps at roof level, these are insignificant so should pose no issues.		Yes
Air Source Heat Pumps 	An Air Source Heat Pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside temperature is as low as minus 15°C and typically draws approximately a quarter to a third of the electricity of a standard resistance heater for the same amount of heating, reducing utility bills. This typical efficiency compares to 70-95% for a fossil-fuel powered boiler. Air Source Heat Pumps (ASHP) are proposed for use within the office areas to provide the heating and cooling requirements. The benefits of ASHP are as follows: <i>They are ideally suited to serve the office areas within the development during periods when they may require heating or cooling. The times when cooling is required may differ for different space depending on their use, occupancy period and levels, the operation of individual air source heat pumps would allow individual control and can be efficiently accommodated within the building design;</i> <i>The heat pump unit can be configured to provide internal heat reclaim from dissimilar environmental zones, reducing energy consumption and carbon emissions.</i>	
<u>Land Use</u> Air Source Heat Pumps can be installed on ground mounted, roof mounted or wall mounted frames. When installing Air Source Heat Pumps there are various factors to consider; Heat Pumps should be positioned to provide shelter from high winds which can reduce efficiency by causing defrost problems. <u>Noise</u>		

Renewable Technology Feasibility Assessment				Viable?																								
Noise levels are generated by fans, and compressors causing vibrations. The noise levels are dependent on manufacturer and vary accordingly, these will need to be in acceptable levels imposed by planning and Acousticians recommendations.																												
Photovoltaics 		Photovoltaic (PV) modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases silicon. The 9 industrial units will be provided with 73.20 kWp of PV panels.		Yes																								
		<table><tr><th>Typical Unit</th><th>Proposed kWp</th><th>Typical Unit</th><th>Proposed kWp</th></tr><tr><td>Unit 1</td><td>11</td><td>Unit 6</td><td>8.5</td></tr><tr><td>Unit 2</td><td>8.5</td><td>Unit 7</td><td>7</td></tr><tr><td>Unit 3</td><td>8.2</td><td>Unit 8</td><td>8</td></tr><tr><td>Unit 4</td><td>6</td><td>Unit 9</td><td>8</td></tr><tr><td>Unit 5</td><td>8</td><td></td><td></td></tr></table>			Typical Unit	Proposed kWp	Typical Unit	Proposed kWp	Unit 1	11	Unit 6	8.5	Unit 2	8.5	Unit 7	7	Unit 3	8.2	Unit 8	8	Unit 4	6	Unit 9	8	Unit 5	8		
Typical Unit	Proposed kWp	Typical Unit	Proposed kWp																									
Unit 1	11	Unit 6	8.5																									
Unit 2	8.5	Unit 7	7																									
Unit 3	8.2	Unit 8	8																									
Unit 4	6	Unit 9	8																									
Unit 5	8																											
<u>Land Use</u> There are no land issues or adverse visual impacts as the photovoltaic panels are roof mounted.																												
<u>Noise</u> There are no noise issues generated by this technology.																												

Table 6.2 Renewable Energy Options

6.3. SUMMARY

By applying the above passive design and PV measures the savings generated are displayed in Table 6.3, and Figures 6.1 – 6.2. The full calculations can be seen in Appendix D.

	Carbon Dioxide Emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	9.65	3.55
After Energy Efficient, Passive + ASHP + PV Measures	8.33	It is anticipated that a circa 3% saving can be achieved through the use of energy efficient fittings, for example A or A+ appliances. This would reduce the unregulated carbon emissions to: 3.44
Total Cumulative Saving	1.32 (13.66%)	0.11

Table 6.3 Carbon Dioxide Emissions

The energy strategy for the development is shown in table 6.4 below

Development Energy Strategy	
Heating	ASHP has been used within the office spaces Panel heaters for the WC and circulation spaces Warehouse treated as unheated
Cooling	Cooling within office spaces has been provided by the ASHP.
Ventilation	MVHR within office and extract fans for the WC.
Hot Water (DHW)	Instantaneous Hot Water only.
Lighting	Energy efficient LED lighting where applicable: Warehouse – 95 lm/w Office Area’s – 110 lm/w Circulation Area’s – 110 lm/W WC’s – 110 lm/W

Table 6.4 Development Energy Strategy

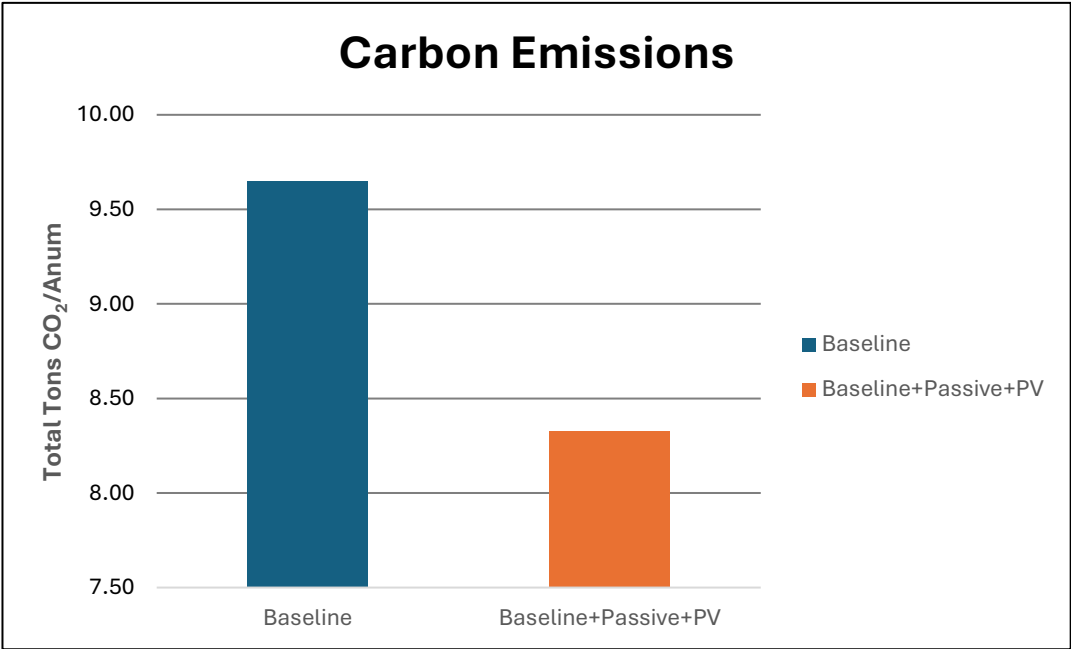


Figure 6.1 Site Carbon Emissions

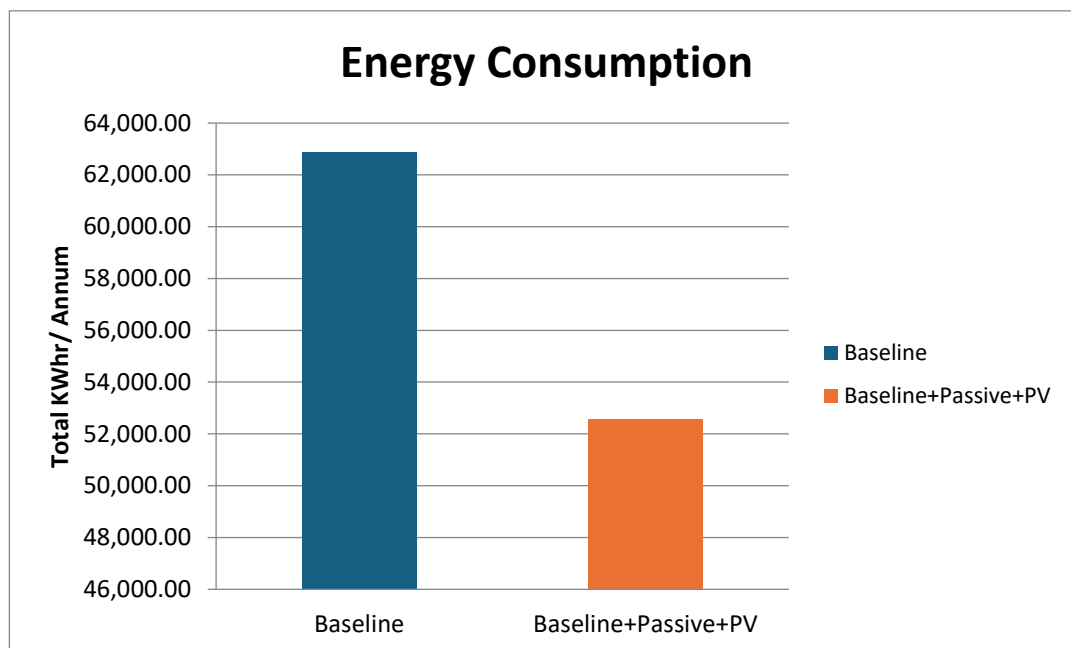


Figure 6.2 Site Energy Consumption

The above review has resulted in the formulation of an Energy Strategy that may be adopted for the development involving the use of passive design and energy efficiency measures aimed at achieving the targets and recommendations set out by the Wokingham borough Council. The current energy strategy for the development includes the use of an Air Source Heat Pump and Photovoltaic Array.

The recommended schemes take into consideration the most appropriate technologies available to the site, which provides a scheme that is commercially viable whilst keeping in compliance with National and Local Policies. The use of further/emerging technologies may be included for use within this development if their feasibility increases in the future, in accordance with best practice.

7. WATER CONSUMPTION

The ever-increasing impacts of climate change are continuously inflating demand for water, as well as increasing a need for awareness towards water usage. The UK is already under a large amount of pressure regarding water resources. To contribute towards mitigating this issue, the proposed development will consider various means of being economical with water consumption.

7.1. POLICY REVIEW

National Planning Policy Framework (2023)

Local plans should set out strategic priorities for the area; this should include strategic policies to deliver the provision of infrastructure for waste management, water supply and wastewater.

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

1. In respect of all new homes:
 - a) Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;
 - b) Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).
2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
 - a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
 - b) Meet or exceed statutory requirements for water resource management.
3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

7.2. DEVELOPMENT SUSTAINABILITY FEATURES

In order to ensure the reduction and management of water consumption within the proposed industrial units, it is anticipated that various measures shall be undertaken, and specific features installed during the fit out works to minimise the building's potable water consumption.

It is anticipated that improvements in the consumption of potable water will be achieved through the specification of water efficient components within sanitary areas during the fit out works. Such features include the specification of low flow taps as well as dual flush toilets with reduced flush volumes.

7.3. SUMMARY

To ensure the sustainability of the development it is anticipated that water efficient fixtures will be incorporated into the design, such as low flow taps and dual flush toilets with reduced effective flush volumes.

To be further sustainable, it is anticipated that pulsed water meters will be installed on the mains water supply, to effectively monitor water consumption. The inclusion of the above sustainability features allows for the development to be deemed sustainable with regard to water consumption.

8. TRANSPORT

Transport produces a large proportion of the country's greenhouse gas emissions, something which government at both national and local level are striving to combat, especially through planning frameworks for new developments. Solutions to transport issues are to be incorporated into the design of the development.

8.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 9 – Promoting Sustainable Transport

Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

- a) the potential impacts of development on transport networks can be addressed;
- b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;
- c) opportunities to promote walking, cycling and public transport use are identified and pursued;

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC07: Parking

1. Planning permission will only be granted where the proposal demonstrates the following:
 - a. How the proposed parking provision meets the standards set out in Appendix 2 of the MDD

Policy CC08: Safeguarding alignments of the Strategic Transport Network & Road Infrastructure

Routes required for the improvement of the Strategic Transport Network and for other transport related schemes indicated on the Policies Map or listed in Appendix 3 of the MDD will be protected and safeguarded. Proposals for development which would compromise the implementation of these routes would not be supported.

8.2. DEVELOPMENT SUSTAINABILITY FEATURES

The proposed development is located next to the Eversley Road A327. The development is approximately 0.6 mile away from the nearest Rickman Close bus stop which can be used to move around the area of Reading as shown in Figure 8.1 below. The proposed development includes the provision of 64 car, 4 motorcycle and 22 cycle parking spaces as show on the site plan 2.1. The site is also near to the national cycle network route 23.

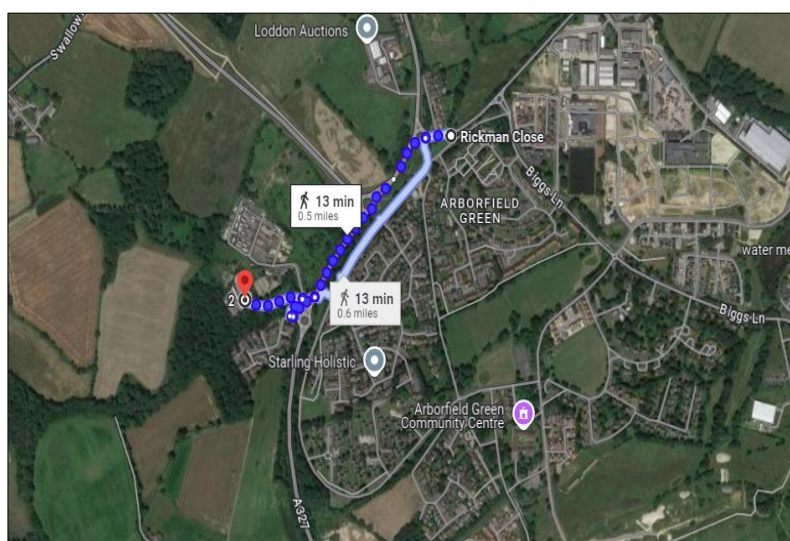
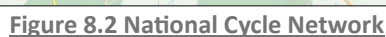


Figure 8.1 Nearest Bus Stop



The above provisions aim to make the proposed development easier to access for all building users, as well as offering a sustainable means of commuting rather than using a private vehicle. The site is situated a 13-minute walk from the nearest bus stop Rickman Close, promoting sustainable alternative means of travel.

9. CONSTRUCTION SITE MANAGEMENT

The requirement for new materials needs to be minimised, by re-using existing buildings and materials where possible and providing a Site Waste Management Plan for all construction sites. This responsibility lies with the contractor and needs to be clarified at an early design stage. It is becoming a greater requirement now to construct buildings that are flexible and can be re-used.

9.1. POLICY REVIEW

National Planning Policy Framework (2023)

Local plans should set out strategic priorities for the area; this should include strategic policies to deliver the provision of infrastructure for waste management, water supply and wastewater.

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
 - a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
 - b) Meet or exceed statutory requirements for water resource management.
3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

9.2. DEVELOPMENT SUSTAINABILITY FEATURES

In order to comply with national and local policy, it is anticipated that certain measures will be put into place for this development, such as a Site Waste Management Plan which monitors the site energy and water consumption. Further to this the Site Waste Management Plan should also monitor the resource efficiency of the development construction works as well as the percentage of non-hazardous materials, excavation and construction, which have been diverted from landfill.

It is expected that the main contractor will also set targets and monitor site consumption data for water consumption, energy consumption as well as fuel from deliveries and collection of waste and materials to and from site. Monitoring of such actions can encourage contractors to become more resource efficient to meet given targets.

Additionally, it is expected the main contractor will comply with best standards as set out in the Considerate Constructors Scheme, achieving a score which is considered as exceeding compliance with the criteria of the scheme.

To ensure the sustainable construction of the development, the project will consider the concept of the waste hierarchy as seen in Figure 9.1 below. The waste hierarchy recognises the need for waste to be considered for a variety of waste streams before being sent to land fill as a last resort. The hierarchy is as follows:

- *Waste minimisation;*
- *Reusing or waste or up cycling;*
- *Recycling of all applicable materials;*
- *Recovery of energy from waste (anaerobic digestion plants);*
- *Waste is sent to landfill.*

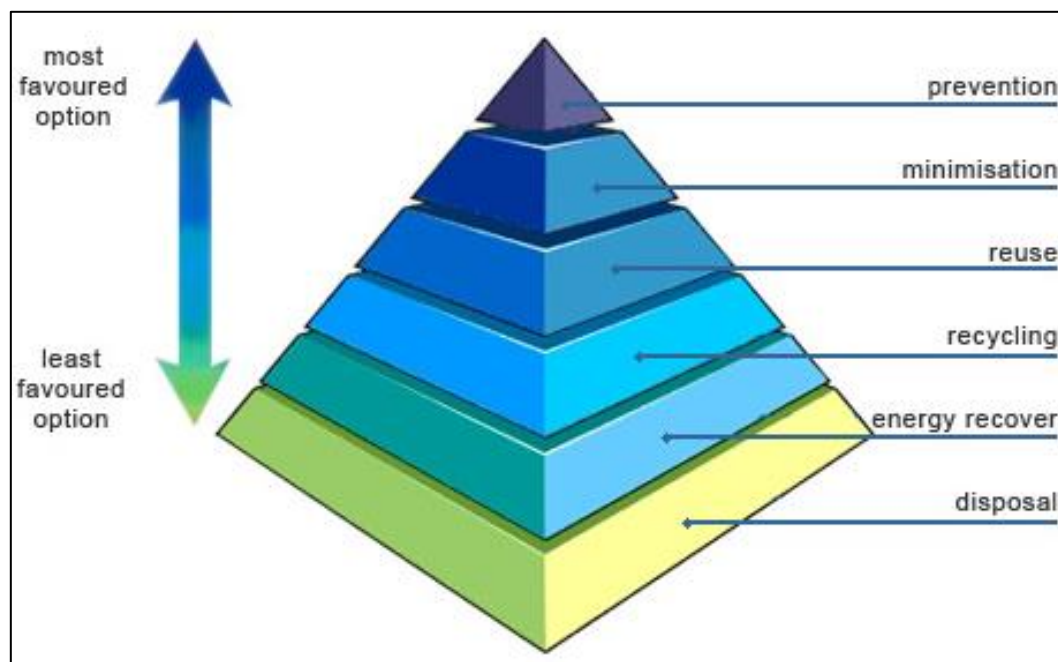


Figure 9.1 Waste Hierarchy Diagram

9.3. SUMMARY

It is anticipated that this development will produce a Site Waste Management Plan, highlighting key refurbishment materials and the correct waste streams for recycling these materials.

The development should adhere to a Considerate Constructors Scheme, achieving a targeted score which exceeds 'compliance' with the criteria of the scheme. As a result of these measures, the development may be deemed sustainable as regards to construction site management.

10. SUSTAINABLE DESIGN

Good urban design is essential in providing a varied and sustainable environment, which can facilitate opportunities for positive contributions within communities. As part of sustainable design for developments, it is essential that suitable design principles are followed to maximise opportunities for energy reduction through design as well as ensuring buildings follow or enhance the character of an area. Developments should also give further consideration to the level of security and comfort that is provided for future building users, including thermal and visual comfort, inclusivity and safe access.

10.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 12- Achieving Well-Designed Places

The creation of high-quality buildings and places is fundamental to what the planning and development process should achieve. Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities. Being clear about design expectations, and how these will be tested, is essential for achieving this. So too is effective engagement between applicants, communities, local planning authorities and other interests throughout the process.

ADOPTED CORE STRATEGY DEVELOPMENT PLAN (JANUARY 2010)

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

1. Maintain or enhance the high quality of the environment;
2. Minimise the emission of pollutants into the wider environment;
3. Limit any adverse effects on water quality (including ground water);
4. Ensure the provision of adequate drainage;
5. Minimise the consumption and use of resources and provide for recycling;
6. Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;
7. Avoid areas of best and most versatile agricultural land;
8. Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;
9. Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);
10. Provide attractive, functional, accessible, safe, secure and adaptable schemes;
11. Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and

10.2. DEVELOPMENT SUSTAINABILITY FEATURES

The proposed development shall include a variety of features which are regarded as having a good sustainable design. It is anticipated that any external lighting specified will be designed to reduce unnecessary light pollution during night time hours.

To ensure the risk of potential overheating is minimised building modelling of the unit has confirmed that no occupied space is at risk from excessive solar gains; this being achieved through use of glazing with a low shading coefficient. Additionally, to ensure that overheating will not occur during summer months and the building is suitably insulated as well as allowing for adaptation due to the effects of climate change, it is anticipated that the development will use building fabrics with enhanced 'U' values which go beyond the minimum requirements of Part L (2021), as seen within Table 10.1. Further to this the energy efficiency measures discussed within Section 6.0 will be incorporated into the design of the development. It is anticipated that such measures will lower the building's energy requirements making its operation feasible and practical for years to come.

Element	Part L Requirement	U Value Specified	% Improvement
Wall	0.26	0.22	15.39%
Roof	0.16	0.15	6.25%
Floor	0.18	0.18	N/A
Glazing	1.6	1.2	25%

Table 10.1 U Value Improvements

To provide a fully sustainable development it is also anticipated that the materials used for the following main elements of the development shall be rated under the Green Guide to Specification targeting ratings between A+ and D:

- *External walls;*
- *Ground floor;*
- *Roof;*
- *Windows.*

To provide a development which remains sustainable during its operation phase, it is anticipated that space will be provided for the provision of waste storage facilities with additional space of recyclable waste streams. This is to enable building users to sort waste before collection and minimise the quantity of waste that may end up at landfill.

10.3. SUMMARY

In order to comply with national and local policies, the development shall strive to provide both to building users and the local community a building of sustainable design.

Measures should be taken to ensure the thermal comfort of future building users, through efforts such as ensuring no occupied areas will result in excessive solar gains and in turn over heating.

External lighting except safety and security lighting should be designed to be switched off automatically through the use of timers or day light sensors as well as the specification of cut off luminaires to reduce any potential light spill on to neighbouring properties.

The above design features allow for the proposed development to be of sustainable design.

11. FLOOD RISK

To prevent an increase in surface water run off through development of a site, it is imperative that consideration is given to the reduction of over land flow during storm events as well as the impact of development in potential flood risk areas.

11.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 14- Meeting the Challenge of Climate Change, Flooding and Coastal Change

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC09: Development and Flood Risk (from all sources)

1. All sources of flood risk, including historic flooding, must be taken into account at all stages and to the appropriate degree at all levels in the planning application process to avoid inappropriate development in areas at risk of flooding. Proposals must be consistent with the guidance in paragraphs 99-104 of the National Planning Policy Framework (NPPF); the Technical Guidance to the NPPF and demonstrate how they have used the Strategic Flood Risk Assessment (SFRA) to determine the suitability of the proposal.
2. Development proposals in Flood Zones 2 or 3 must take into account the vulnerability of proposed development.
3. Development must be guided to areas of lowest flood risk by applying the sequential approach taking into account flooding from all sources and shall ensure flood risk is not worsened for the application site and elsewhere, and ideally that betterment of existing conditions is achieved. The sequential test will not be required if at least one of the following applies:
 - a. Replacement of an existing single residential property. However, the replacement property should, where possible, be located on the part of the site at lowest risk
 - b. Conversions and change of use unless it involves a change to a more vulnerable class
 - c. Minor development, as defined in footnote 10 of the Technical Guidance Note to the NPPF.
4. In exceptional circumstances, new development in areas of flood risk will be supported where it can be demonstrated that:
 - a. The development provides wider sustainability benefits to the community that outweigh flood risk
 - b. The development will:
 - i. Be safe for its lifetime, taking account of the vulnerability of its users
 - ii. Not increase flood risk in any form elsewhere and, where possible, will reduce flood risk overall
 - iii. Incorporate flood resilient and resistant measures into the design
 - a. Appropriate evacuation and flood response procedures are in place to manage the residual risk associated with an extreme flood event.

11.2. DEVELOPMENT SUSTAINABILITY FEATURES

The flood map sourced from The Government Flood Warning Information Service seen below in Figure 11.1, demonstrates that the proposed site is predominantly located within Flood Zone 1 and as such is not at risk of flooding from fluvial or surface water sources.

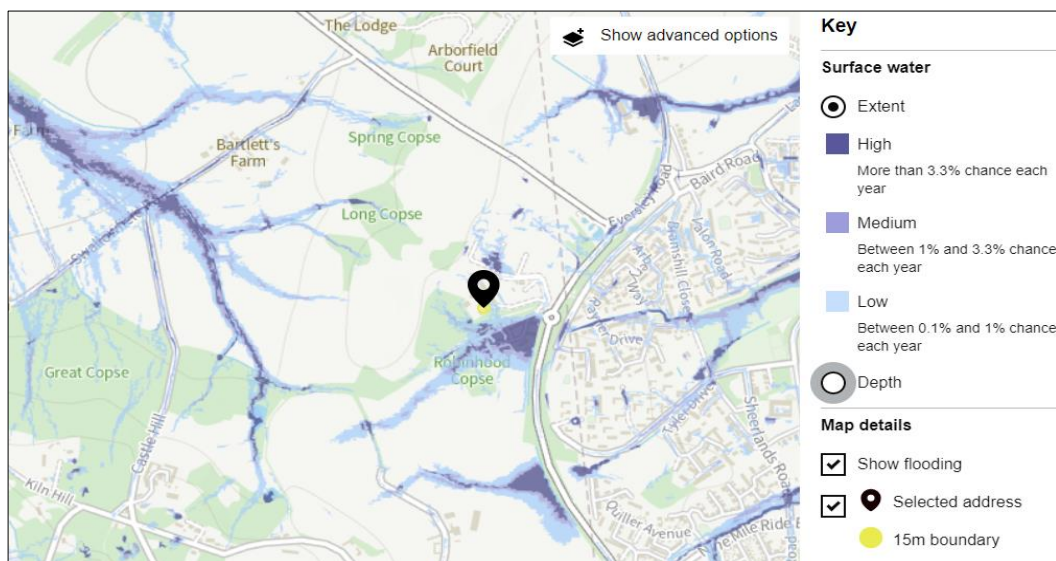


Figure 11.1: Surface Water Flooding (Sourced from Flood Warning Information Service)

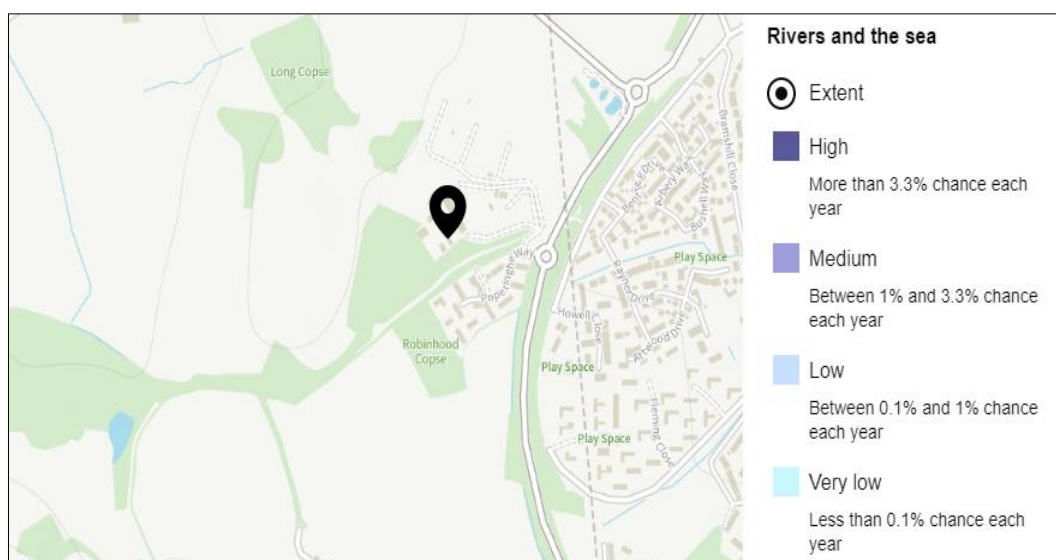


Figure 11.2: River and sea Flooding (Sourced from Flood Warning Information Service)

11.3. SUMMARY

The above maps confirm that the site is located within Flood Zone 1 and is not at risk from fluvial or reservoir flooding.

12. NOISE

Noise is a subjective concept that can affect people differently, however there are set standards as to acceptable levels of noise, for different areas and times of day. In this instance, the proposed development would be subject to potential noise pollution from road sources.

12.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 15- Conserving and Enhancing the Natural Environment

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- a) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.*

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy CC06: Noise

1. Proposals must demonstrate how they have addressed noise impacts to protect noise sensitive receptors (both existing and proposed) from noise impacts in line with Appendix 1 of the MDD.
2. Noise impact of the development must be assessed. Where there is no adverse impact (No Observed Effect Level) then noise will not be a material consideration.
3. Where there is an adverse effect (Lowest Observed Adverse Effect Level to Significant Observed Adverse Effect Level), then
 - a. The development layout must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.
 - b. Where there is still an adverse impact then internal layout must be reviewed. Where this results in there no longer being an adverse impact then design and measures should be incorporated accordingly.
 - c. Where there is still an adverse impact then physical mitigation measures such as barriers/mechanical ventilation must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.
 - d. Where there is still an adverse impact and the development falls within the significant observed adverse effect level then planning permission will normally be refused.

12.2. DEVELOPMENT SUSTAINABILITY FEATURES

The proposed development is not subject to extreme noise pollution from road and rail sources, as can be seen in figure 12.1. It should be noted that the noise levels are 'A' weighted and as such only demonstrate sounds on a frequency that would affect human populations, it does not consider noise on frequencies that may affect any local habitats.

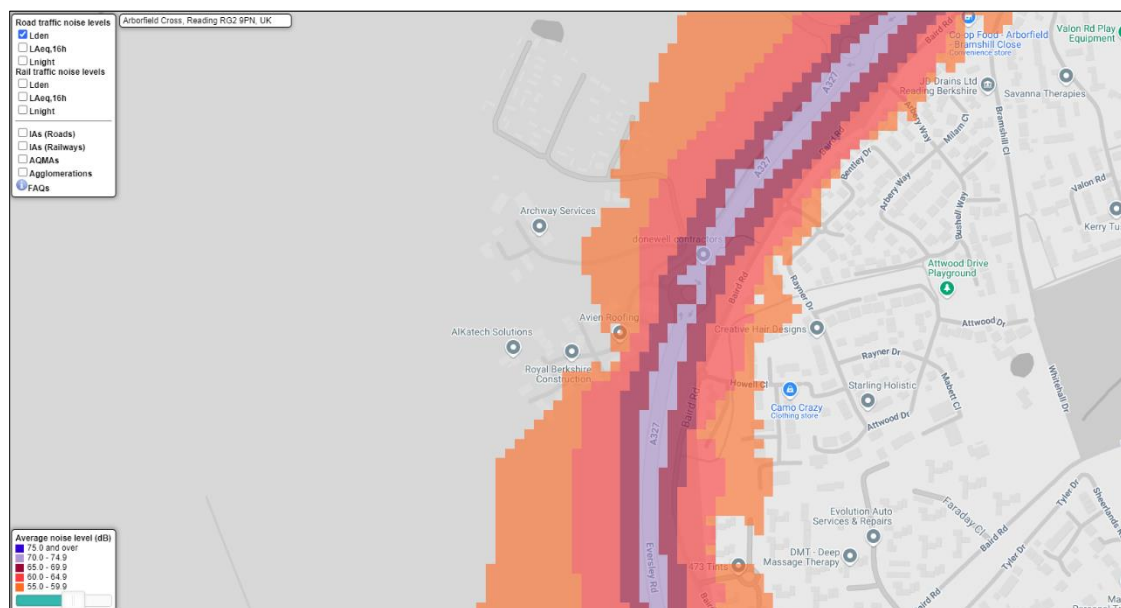


Figure 12.1: Road Noise Data Map (Postal Code Analysis, Sourced from Extrium)

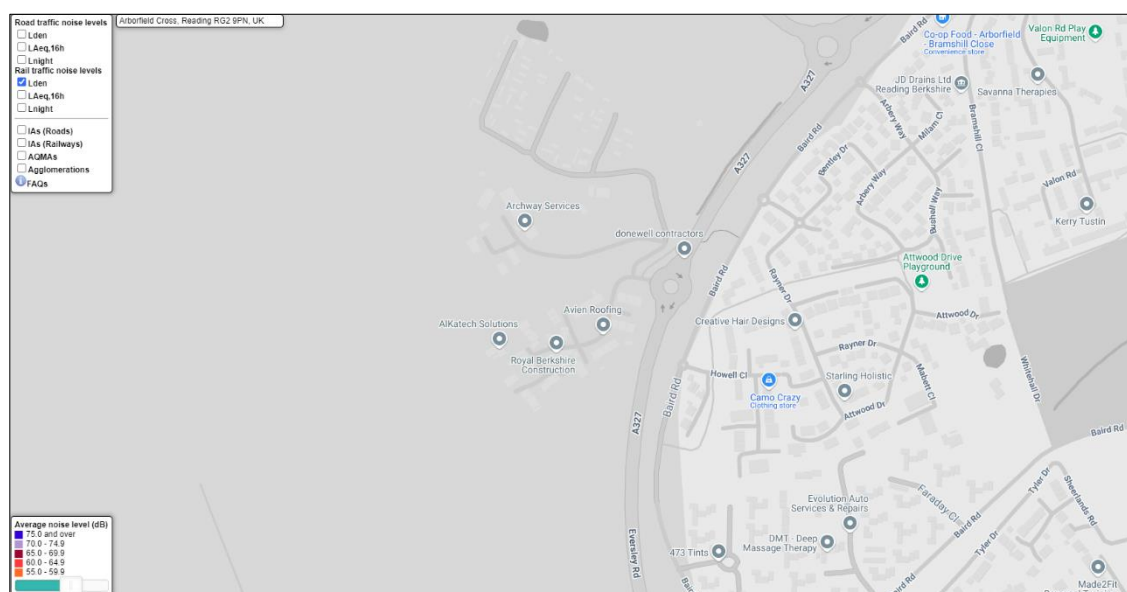


Figure 12.2: Rail Noise Data Map (Postal Code Analysis, Sourced from Extrium)

12.3. SUMMARY

The development would not be subject to sources of noise pollution from the surrounding roads or from rail sources and that there are no noise impacts generated by the development.

13. ECOLOGY

Ecology is essential within many communities, with the mix of flora and fauna facilitating benefits such as flood alleviation and pollution amelioration. In addition to this, areas with a wealth of green spaces and an abundance of biodiversity are seen to provide a positive contribution to a community.

13.1. POLICY REVIEW

National Planning Policy Framework (2023)

Section 15- Conserving and Enhancing the Natural Environment

The planning system should protect and enhance valued landscapes, minimise impacts on biodiversity.

WOKINGHAM BOROUGH DEVELOPMENT PLAN (FEBRUARY 2014)

Policy TB24: Designated Heritage Assets (Listed Buildings, Historic Parks and Gardens, Scheduled Ancient Monuments and Conservation Areas)

1. Historic Parks and Gardens, Scheduled Monuments and Conservation Areas are shown on the Policies Map.
2. The Borough Council will conserve and seek the enhancement of designated heritage assets in the Borough and their settings by:
 - a. Requiring works to or affecting heritage assets or their setting to demonstrate that the proposals would at least conserve and, where possible enhance the important character and special architectural or historic interest of the building, Conservation Area, monument or park and garden including its setting and views.
 - b. Supporting development proposals or other initiatives that will conserve and, where possible, enhance the local character, setting, management and historic significance of designated heritage assets, with particular support for initiatives that would improve any assets that are recognised as being in poor condition or at risk.

13.2. DEVELOPMENT SUSTAINABILITY FEATURES

The proposed development is far from the nearest Site of Special Scientific Interest (SSSI) as shown below in Figure 13.1. The nearest Longmoor Bog SSSI, is approximately 3 miles away from the development.



Figure 13.1 Ecological Sensitivity (Sourced from MAGIC)

13.3. SUMMARY

An Ecology conservation map (sourced from MAGIC) highlights there are no Sites of Special Scientific Interest (SSSI) in the vicinity of the site development.

APPENDIX A – FLOOD RISK MAP

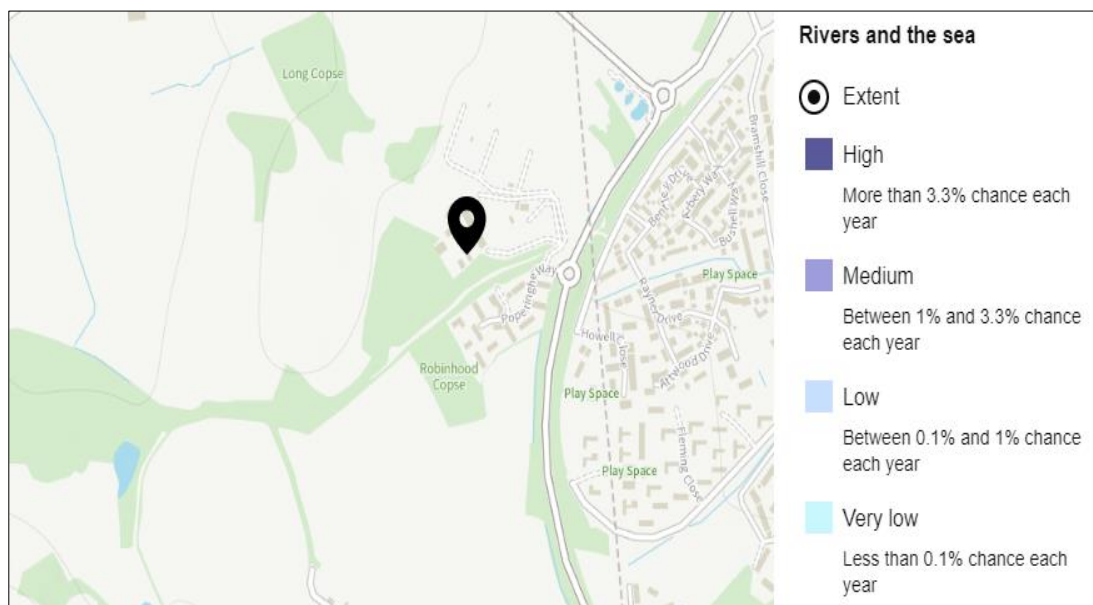
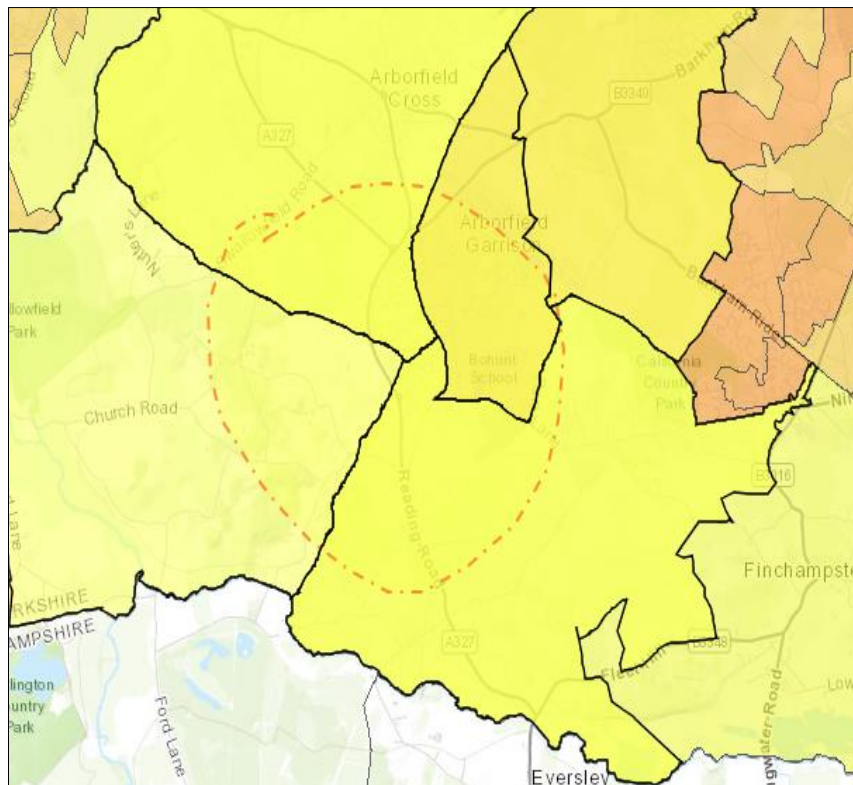


Figure 11.1: Surface Water Flooding (Sourced from Flood Warning Information Service)

APPENDIX B – CHP SEARCH



CHP availability Search Area

Sector Name	Share	Total MWh
Communications and Transport	0.2%	111 MWh
Commercial Offices	1.79%	1,007 MWh
Domestic	89.05%	49,978 MWh
Education	2.3%	1,291 MWh
Government Buildings	0.03%	16 MWh
Hotels	0.54%	303 MWh
Large Industrial	0%	0 MWh
Health	0.1%	54 MWh
Other	0.2%	111 MWh
Small Industrial	4.27%	2,398 MWh
Prisons	0%	0 MWh
Retail	0.51%	285 MWh
Sport and Leisure	0.86%	481 MWh
Warehouses	0.17%	94 MWh
District Heating	0%	0 MWh
Total heat load in Area		56,127 MWh

Total Heat Load Distribution

APPENDIX C – WIND MAP

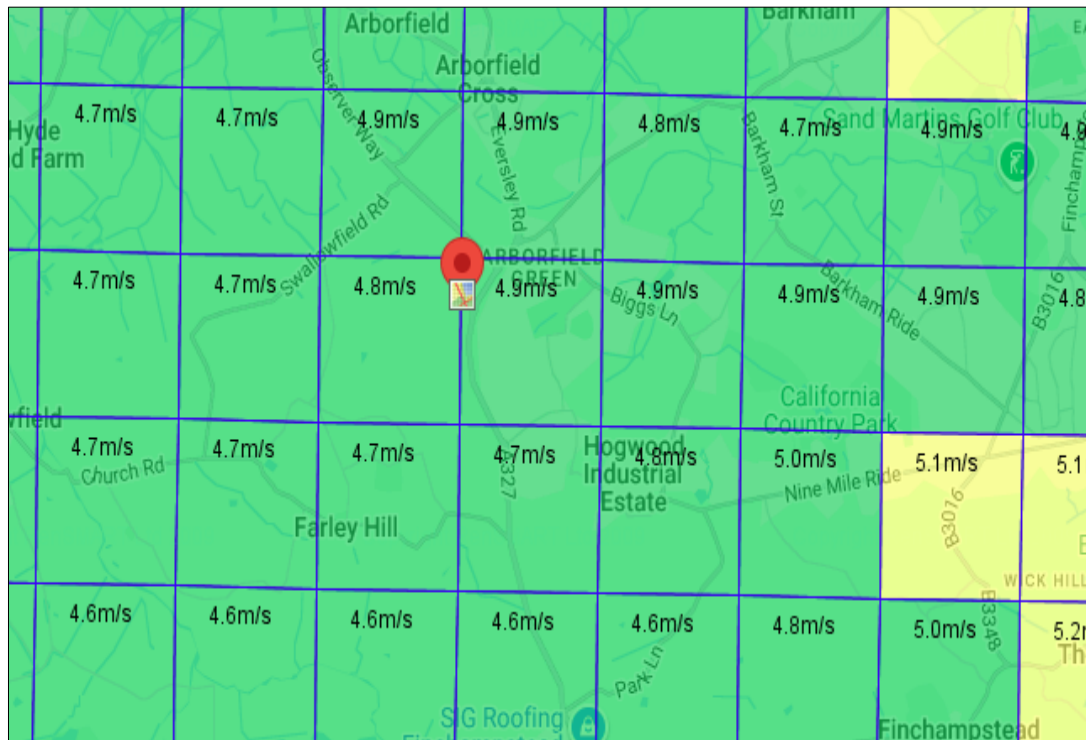


Chart C.1 Wind Velocity Chart for the Development Site

APPENDIX D – ENERGY CALCULATIONS

Baseline Energy and Carbon Calculations

Regulated Energy Demand												
kWh/m ² /annum Baseline												
Typical Unit	Area	Heating	Cooling	Auxiliary	Lighting	Hotwater	Total	kWh/Annum	kgCO ₂ /m ² /Annum	Total kgCO ₂ /Annum	Total TonsCO ₂ /Annum	PV kWh/m ²
Unit 1	417.50	9.93	3.37	1.51	25.30	3.85	26.36	11,005.30	4.00	1,670.00	1.67	17.51
Unit 2	285.00	13.00	1.33	0.71	22.75	3.70	32.01	9,122.85	4.78	1,362.30	1.36	9.48
Unit 3	213.80	11.31	1.25	0.79	24.34	3.66	28.56	6,106.13	4.31	921.48	0.92	12.78
Unit 4	179.00	12.56	1.22	0.85	25.03	3.62	29.88	5,348.52	4.52	809.08	0.81	13.40
Unit 5	247.60	13.86	1.18	0.71	24.51	3.71	34.42	8,522.39	5.12	1,267.71	1.27	9.56
Unit 6	269.30	11.84	0.51	0.48	26.73	3.97	22.79	6,137.35	3.62	974.87	0.97	20.74
Unit 7	180.60	16.84	0.82	0.75	30.57	3.89	27.78	5,017.07	4.42	798.25	0.80	25.08
Unit 8	200.00	20.34	0.60	0.60	30.04	3.87	29.09	5,818.00	4.61	922.00	0.92	26.37
Unit 9	200.00	20.10	0.74	0.62	30.34	3.88	29.09	5,818.00	4.61	922.00	0.92	26.60
Total	2,192.80							62,895.61			9.65	

Passive + Be Green Energy and Carbon Savings

kWh/m ² /annum Baseline + Passive + PV												
Typical Unit	Area	Heating	Cooling	Auxiliary	Lighting	Hotwater	Total	kWh/Annum	kgCO ₂ /m ² /Annum	Total kgCO ₂ /Annum	Total TonsCO ₂ /Annum	PV
Unit 1	417.50	9.93	3.37	1.51	25.30	3.75	22.94	9,577.45	3.56	1,486.30	1.49	20.93
Unit 2	285.00	13.00	1.33	0.71	22.75	3.70	27.55	7,851.75	4.21	1,199.85	1.20	13.94
Unit 3	213.80	11.31	1.25	0.79	24.34	3.66	24.24	5,182.51	3.76	803.89	0.80	17.10
Unit 4	179.00	12.56	1.22	0.85	25.03	3.62	25.53	4,569.87	3.97	710.63	0.71	17.75
Unit 5	247.60	13.86	1.18	0.71	24.51	3.71	27.94	6,917.94	4.29	1,062.20	1.06	16.04
Unit 6	269.30	11.84	0.51	0.48	26.73	3.97	18.45	4,968.59	3.07	826.75	0.83	25.08
Unit 7	180.60	16.84	0.82	0.75	30.57	3.89	22.06	3,984.04	3.69	666.41	0.67	30.80
Unit 8	200.00	20.34	0.60	0.60	30.04	3.87	23.69	4,738.00	3.92	784.00	0.78	31.77
Unit 9	200.00	20.10	0.74	0.62	30.34	3.88	23.93	4,786.00	3.95	790.00	0.79	31.76
Total	2,192.80							52,576.15			8.33	

Carbon Savings

Carbon Calculations (Regulated Energy Demands) Carbon								
Typical Unit	Total Area	Carbon Baseline kgCO ₂ /annum	Improved Emissions after Passive/Energy Efficiency (kgCO ₂ /annum)	Improved Emissions after CHP (kgCO ₂ /annum)	Improved Emissions after Passive + PV (kgCO ₂ /annum)	Total kgCO ₂ /annum displaced	Total TonsCO ₂ /annum displaced	Total % TonsCO ₂ /annum displaced
Unit 1	417.50	1,670.00			1,486.30	183.70	0.18	11.00
Unit 2	285.00	1,362.30			1,199.85	162.45	0.16	11.92
Unit 3	213.80	921.48			803.89	117.59	0.12	12.76
Unit 4	179.00	809.08			710.63	98.45	0.10	12.17
Unit 5	247.60	1,267.71			1,062.20	205.51	0.21	16.21
Unit 6	269.30	974.87			826.75	148.12	0.15	15.19
Unit 7	180.60	798.25			666.41	131.84	0.13	16.52
Unit 8	200.00	922.00			784.00	138.00	0.14	14.97
Unit 9	200.00	922.00			790.00	132.00	0.13	14.32
Total	2,193						1.32	13.66

Energy Savings

Energy Calculations (Regulated Energy Demands) Energy							
Typical Unit	Total Area	Energy Baseline (kWh/annum)	Total Energy with Passive/Energy Efficiency Measures (kWh/annum)	Total Energy after CHP (kWh/annum)	Total Energy with Passive + PV measures (kWh/annum)	Total Displaced Energy from Baseline (kWh/annum)	Total % kWh/annum displaced
Unit 1	417.50	11,005.30			9,577.45	1,427.85	12.97
Unit 2	285.00	9,122.85			7,851.75	1,271.10	13.93
Unit 3	213.80	6,106.13			5,182.51	923.62	15.13
Unit 4	179.00	5,348.52			4,569.87	778.65	14.56
Unit 5	247.60	8,522.39			6,917.94	1,604.45	18.83
Unit 6	269.30	6,137.35			4,968.59	1,168.76	19.04
Unit 7	180.60	5,017.07			3,984.04	1,033.03	20.59
Unit 8	200.00	5,818.00			4,738.00	1,080.00	18.56
Unit 9	200.00	5,818.00			4,786.00	1,032.00	17.74
Total	2,193						16.41

APPENDIX E - BRUKL

BRUKL Output Document

Compliance with England Building Regulations Part L 2021



Project name

Unit 1 Boundoaks Works

As designed

Date: Thu Sep 19 15:05:52 2024

Administrative information

Building Details

Address: Boundoak Works, Eversley Road, Arborfield, RG2 9PN

Certifier details

Name: Sushil Pathak

Telephone number: 01344 628821

Address: Cudd Bentley, Ashurst Manor, Sunninghill, SL5 7DD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.d.0

Interface to calculation engine: Energy Simulator

Interface to calculation engine version: 10.9.2.36

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 91

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.56
Target primary energy rate (TPER), kWh/m ² annum	41.5
Building primary energy rate (BPER), kWh/m ² annum	36.17
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.22	0.22	Wall 1
Floors	0.18	0.18	0.18	Internal Floor 1
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.15	0.15	Exposed Roof 1
Windows** and roof windows	1.6	1.2	1.2	Window 1
Rooflights***	2.2	-	-	No external rooflights
Personnel doors [^]	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. [^] For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- WC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

3- Circulation Area

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
U1.FF.OFF	-	-	-	-	1.1	-	-	-	-		0.8	N/A
U1.FF.WC	-	-	0.3	-	-	-	-	-	-		-	N/A
U1.GF.WC	-	-	0.3	-	-	-	-	-	-		-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
U1.FF.OFF		110	-	-
U1.FF.WC		110	-	-
U1.GF.WC		110	-	-
U1.FF.CIR		110	-	-
U1.GF.CIR2		110	-	-
U1.GF.CIRC		110	-	-
U1.GF.WH		95	-	-
U1.UM		95	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U1.FF.OFF	NO (-79.1%)	NO
U1.GF.WH	NO (-58.5%)	NO
U1.UM	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	417.5	417.5
External area [m ²]	1299.7	1299.7
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	314	418.38
Average U-value [W/m ² K]	0.24	0.32
Alpha value* [%]	38.8	62.79

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
100	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	9.93	12.42
Cooling	3.37	2.27
Auxiliary	1.51	1.43
Lighting	25.3	17.92
Hot water	3.75	3.75
Equipment*	32.04	32.04
TOTAL **	43.87	37.8

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	20.93	10.18
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>20.93</i>	<i>10.18</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	217.63	296.44
Primary energy [kWh/m ²]	36.17	41.5
Total emissions [kg/m ²]	3.56	4

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	43.4	146.3	3.7	11.4	4.6	3.26	3.55	3.5	5
Notional	128.5	122.1	13.5	7.7	3.8	2.64	4.4	---	---
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	135.2	29.7	46.9	0	6.6	0.8	0	1	0
Notional	236.9	67.8	49.1	0	13.1	1.34	0	---	---
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	190.1	79.6	66	0	0	0.8	0	1	0
Notional	299.6	100.7	62.1	0	0	1.34	0	---	---
[ST] No Heating or Cooling									
Actual	147	76.8	0	0	0	0	0	0	0
Notional	236.4	62.2	0	0	0	0	0	---	---

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEEF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type



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