



BUILDING REGULATIONS COMPLIANCE SERVICES



SUSTAINABILITY STATEMENT FOR THE PROPOSED DEVELOPMENT AT

Curzon Club,
362 Oxford Rd, Reading,
RG30 1AQ.

Produced by	Date	Client
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Contents

1.	Introduction	4
2.	Planning Policies	4
2.1.	National Planning Policy Framework (February 2019)	4
2.2.	Reading Borough Local Plan.....	5
2.3.	National Sustainability Guidelines	7
3.	Proposed Development.....	9
4.	Sustainability Statement	9
5.	Energy	10
5.1.	Energy demand.....	11
5.2.	Maximise use of passive energy.....	11
5.3.	Increased Energy Efficiency	12
5.4.	Renewable Energy Sources.....	12
5.5.	Responsible travel provisions	12
6.	Water	13
6.1.	Water saving measures.....	13
6.2.	Water consumption.....	13
6.3.	Reusing water.....	14
6.4.	Metering	14
7.	Materials and Waste	14
7.1.	Design Stage	14
7.2.	Construction Stage.....	14
7.3.	Storage for Recyclables and Waste	15
8.	Nature Conservation and Biodiversity	15
8.1.	Protecting Species and Promoting the Protection and planting of Trees.....	15
8.2.	Designing development proposals.....	16
9.	Increased Green Cover and Trees	16
9.1.	Promoting Urban Greening	16

10.	Tackling Increased Temperatures and Drought	16
10.1.	Preventing developments from overheating	16
10.2.	Promoting Heat and Drought resistant planting.....	17
11.	Flooding	17
11.1.	Surface Water Flooding	17
11.2.	Flooding Resilience and Resistance	17
11.3.	Flooding and Basement Developments.....	18
12.	Land Contamination	18
12.1.	Responsible Person or Organisation.....	18
12.2.	Bioremediation.....	18
13.	Air Pollution	18
13.1.	Assessment Requirements.....	18
13.2.	Construction and Demolition	19
13.3.	Design and Occupation	19
14.	Noise.....	19
14.1.	Sources of Noise.....	19
14.2.	Mitigation of Noise emitted by the development.....	19
14.3.	Mitigation of Noise impacts on the development	20
15.	Light Pollution	20
15.1.	Type of Light Pollution.....	20
15.2.	Potential Effects	20
15.3.	Lighting Design to minimize the impacts	20
16.	Water Pollution	21
16.1.	How Sustainable Drainage contributes to water quality	21
16.2.	Connection of New Developments to the Sewer Network.....	21
17.	Conclusion.....	21
18.	SAP Calculations – Block Compliance	23
19.	SBEM Calculations	25

1. Introduction

This Sustainability Statement has been prepared by JosTec in support of the planning application for the proposed new build apartment block at the Curzon Club, 362 Oxford Rd, Reading, RG30 1AQ.

Using approved calculation methods (Standard Assessment Procedure – SAP & Design Builder SBEM) we can produce the predicted carbon reduction above the minimum baseline rates through enhanced building fabric and by exploring the use of low and zero carbon technologies, including a potential PV system located at the rooftop of the building.

2. Planning Policies

In this section of the report, National, Regional and Local planning policies and requirements are presented.

The energy and sustainability strategies to meet the policies have also been briefly introduced. The details of how the scheme incorporates these policies have been presented in the body of this report.

2.1. National Planning Policy Framework (February 2019)

Policy 14. Meeting the challenge of climate change, flooding, and coastal change:

151. 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 co-locating potential heat customers and suppliers.

152. 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.

153. In determining planning applications, local planning authorities should expect new developments 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.

2.2. Reading Borough Local Plan.

The Government has sought to consolidate the wide range of standards required for new housing across the country. Housing standards serve an important role in ensuring resident health and well-being.

H5: STANDARDS FOR NEW HOUSING

New build housing should be built to the following standards, unless it can be clearly demonstrated that this would render a development unviable:

- a. All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally-described space standard.
- b. All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations.
- c. All major new-build residential development should be designed to achieve zero carbon homes.
- d. All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.
- e. All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations, unless it is built in line with M4(3).

Given the scale of residential development in Reading up to 2036, achieving the aims of the Climate Change Strategy will not be possible without that development having a minimal impact on carbon emissions.

Therefore, the requirement will be that major new housing is built to zero carbon homes standard. A revised Sustainable Design and Construction SPD produced in 2019 contains more detail on achieving this requirement, but in general, where homes are not designed to be carbon neutral, this will mean as a minimum a 35% improvement in the dwelling emission rate over the 2013 Building Regulations plus a contribution of £1,800 per tonne towards carbon offsetting within Reading (calculated as £60 per tonne over a 30 year period).

2.3. National Sustainability Guidelines

In line with the National Policy the following principals have been used to guide the proposed development.

Strategic

The highest standards of sustainable design and construction should be achieved to improve the environmental performance of new developments and to adapt to the effect of climate change over their lifetime.

Planning Decisions

Development's proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

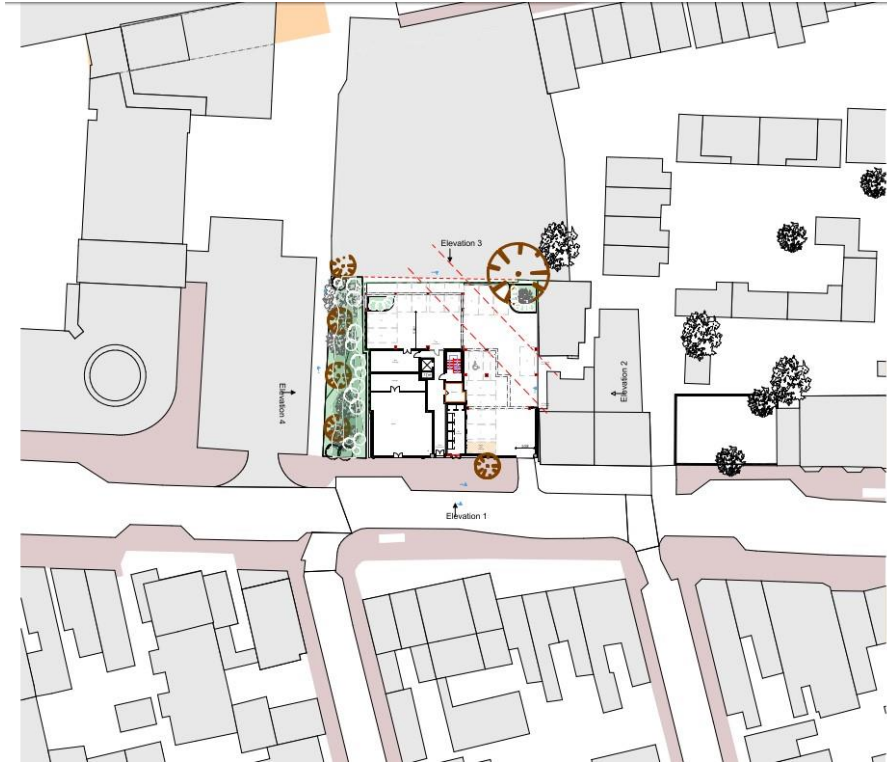
Major developments proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

- 1) Minimising CO₂ emissions across the site, including building and services, such as heating and cooling systems.
- 2) Avoiding internal overheating and contributing to urban heat island effect.
- 3) Efficient use of natural resources (water included), including making the most of natural systems both within and around buildings.
- 4) Minimising pollution, including air, noise, and urban runoff.
- 5) Minimising the generation of waste and maximising reuse and recycling.
- 6) Avoiding impacts from natural hazards such as flooding.

- 7) Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions.
- 8) Securing sustainable procurement of materials, using local supplies where possible.
- 9) Promoting and protecting biodiversity and green infrastructure.

The following report will show how this can be achieved.

3. Proposed Development



Proposal is for the development of a new building at the Curzon Club, 362 Oxford Rd, Reading, RG30 1AQ.

4. Sustainability Statement

The following sections outline considerations of the passive design and energy efficiency measures that have been proposed at 362 Oxford Rd, Reading.

5. Energy

The proposed building will benefit from high performance facades, and it will include high performance glazing (U value = 1.20W/m²K) which will reduce space heating and cooling demands. The entire building, will benefit from new and efficient building services systems as the main heating system for each flat will be a mains gas combi boiler with an integrated heat recovery system.

Building Element	Limiting Parameters Building Regulations Part L1A Table 2	Proposed Values
External Walls	0.30 W/m ² K	0.12 W/m ² K
Dormer Walls	0.30 W/m ² K	0.15 W/m ² K
Party Walls	0.20 W/m ² K	0.0 W/m ² K
Roof 1 (Flat roof)	0.20 W/m ² K	0.14 W/m ² K
Roof 2 (Dormer roof)	0.20 W/m ² K	0.14 W/m ² K
Exposed floor	0.25 W/m ² K	0.19 W/m ² K
Windows: U-value/G-value	2.00 W/m ² K	≤1.20 W/m ² K / 63%
Doors	2.00 W/m ² K	≤1.20 W/m ² K
Air permeability	10.00 m ³ /m ² h @ 50pa	5 m ³ /m ² h @ 50pa
ψ values (Thermal Bridging)	Accredited Construction Details	Accredited Construction Details

The commercial unit will benefit from U values that are lower than the limiting values of the Building Regulations 2013. This is demonstrated on the table below. Overall, a 41.88% reduction can be achieved using this specification combined with efficient heating methods and a 36.4 kW PV System.

Building Element	Limiting Parameters Building Regulations Part L1A	Proposed Values
Walls	0.35 W/m ² K	0.25 W/m ² K
Roof	0.25 W/m ² K	N/A
Floor	0.25 W/m ² K	0.09 W/m ² K
Windows: U-value	2.20 W/m ² K	≤1.40 W/m ² K
High Usage Entrance Doors	3.50 W/m ² K	≤2.82 W/m ² K
Air permeability	10.00 m ³ /m ² h @ 50pa	4 m ³ /m ² h @ 50pa

5.1. Energy demand

Best efforts will be made throughout the proposed new development to reduce the need for energy and heat.

A preliminary Energy Assessment has been carried out to show how it can be improved beyond Part L1A 2013.

As the drawings supplied are at planning stage, assumptions were made about the construction, heating, ventilation, and lighting. Therefore, the energy strategy should be taken as a guide for the proposed development.

5.2. Maximise use of passive energy

Through the use of passive design measures, the design team will enable the development to require less energy optimising insulation, efficient heating systems and controls, natural cross ventilation, improved windows u-values, higher air tightness, and enhanced thermal bridging.

5.3. Increased Energy Efficiency

An energy assessment has been carried out in order to show how the building will go beyond Part L1A 2013. This was based on the corresponding SAP calculations for each flat. An energy assessment (SBEM) was also carried out for the commercial Unit at the ground floor of the development.

The following measures have been considered:

- Highly insulated thermal envelope
- High efficiency heating system and controls
- Reduced Air Permeability target: 5.00m³/m²h @50Pa for the residential units and 4.00m³/m²h @ 50 Pa for the commercial unit.

This Energy assessment has shown an improvement over building regulations Part L1A of 41.88%.

5.4. Renewable Energy Sources

The feasibility of several renewable technologies has been reviewed and show there could be the potential for photovoltaics panels. Having said that, several options were tested regarding the power output and the orientation of the PV system.

As a result, a 36.4 kWp Solar – Photovoltaic system has been considered as a viable option to generate electricity that will provide heating and hot water for the whole development.

5.5. Responsible travel provisions

In West Reading, where the proposed development is located, the principal transport network includes the A329 Oxford Road and A4 Bath Road corridors which are the main road routes. The proposed development is located next to Oxford Road. The main Great Western line towards the West and Wales passes through the area, as well as the lines

towards Newbury and Basingstoke. Reading West station is located 500m away from the proposed development.

6. Water

Initial advice from the design team suggest the water savings measures can be incorporated in order to reduce water usage. It has been identified that there is the opportunity to have low flow rates and dual flush toilets.

6.1. Water saving measures

In terms of water efficiency, there is a clear need to ensure that the highest possible standards are in place, particularly given the likely effects of climate change. The Thames Water area is classed as a 'water-stressed area' by the Environment Agency, and the Thames River Basin Management Plan stresses the importance of demand management in the area. For clarity, the tighter water efficiency standard referred to here and set out in the Building Regulations is 110 litres per person per day.

Initial advice from the design team suggest the water savings measures can be incorporated in order to reduce water usage. It has been identified that there is the opportunity to have low flow rates and dual flush toilets.

6.2. Water consumption

The Proposed Development would be provided with water efficient fixtures, fittings, and appliances, and include measures to encourage efficient water use, including:

- Installation of water meters with pulsed or other open protocol communication output to enable connection to a utility monitoring and management system.
- A leak detection system on the mains water supply between the building and the utilities water meter.
- Processes to reduce unregulated water demand.

6.3. Reusing water

A preliminary feasibility study of the potential to include rainwater harvesting should be carried out. Further assessment with a drainage engineer would be needed. A rainwater butt could be installed and designed for the watering of the site green areas.

6.4. Metering

A water meter will be provided. During detailed design, consideration will be given to the provision of digital meter, rather than standard analogue meters.

7. Materials and Waste

7.1. Design Stage

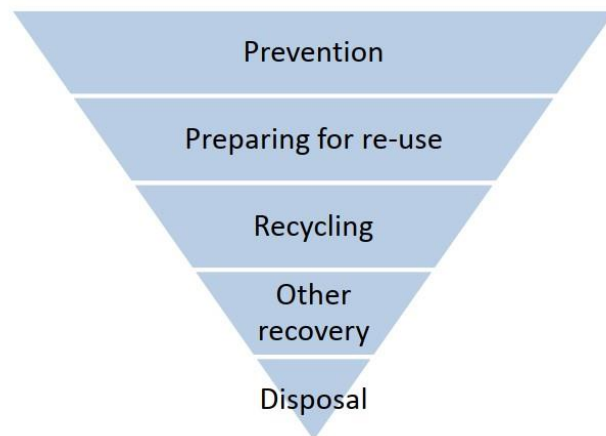
The contractor and developer will need to design and choose materials that will influence the construction process and the embodied carbon of the development by, specifying materials using the BRE's Green Guide Specification. Ensuring that materials are responsibly sourced from local suppliers, minimising the harmful effects of some materials on human health, ensuring that specified materials are adequate and sensitive to the building type.

It is intended that insulation materials will have an Ozone Depletion Potential (ODP) of 0, and a Global Warming Potential (GWP) below 5. Where specified by the developer, finishes will not contain or emit toxic substances.

Timber will be 100% sourced by an FSC certified supplier.

7.2. Construction Stage

The Contractor will need to reduce waste during the construction phase via the hierarchy of, Reduce, Reuse (on site followed by offsite), Recycling (on site followed by offsite), Resource recovery (for energy generation - fuels, heat and power); and only as a last resort, Disposal.



A Site Waste Management Plan (SWMP) will be prepared and will include non-hazardous waste, demolition, and excavation waste.

The BRE Smartwaste tool is strongly recommended for Contractor's use.

7.3. Storage for Recyclables and Waste

Enough internal and external space will be provided to facilitate recycling, composting and the good management of waste for the building users. The building will be fitted with internal waste storage and facilities for the segregation of recyclable materials, according to BS5096.

8. Nature Conservation and Biodiversity

8.1. Protecting Species and Promoting the Protection and planting of Trees.

There are no features of ecological significance (trees) next to the proposed construction.

Whilst measures to enhance the ecological potential of the site will be investigated where possible, opportunities to enhance the ecological value of the site are limited to the gardens surrounding the dwellings.

8.2. Designing development proposals

Efforts will be made to improve the ecological value of the site with planting of native plant species and bird boxes relevant to the native birds in the area.

Developers should adhere to the following hierarchy when considering biodiversity on their development by; firstly, avoiding adverse impact to the biodiversity interest, secondly minimising impact, then seek mitigation, and lastly seek appropriate compensation where the benefits of the proposal clearly outweigh the biodiversity impacts.

9. Increased Green Cover and Trees

9.1. Promoting Urban Greening

To help the city to adapt to future climates. Green infrastructure is a network of mainly vegetated spaces and other environmental features which can promote urban cooling, reduced runoff, reduced energy demand, improved air quality, improved biodiversity, enhanced aesthetic and an increased health and well-being. The development will look to encompass ecological features such as native plant species and trees around the perimeter of the site.

10. Tackling Increased Temperatures and Drought

10.1. Preventing developments from overheating

Overheating within buildings can result from either too much heat entering a building and not being released, or too much heat being generated within a building and not being released. Therefore, if the internal environment becomes too hot it is likely occupiers will try to find a way to cool their environment.

In order to continue minimising CO₂ emissions, the design team will consider the internal comfort and implemented the following measures to reduce overheating, via cross ventilation, lightly colours external walls, and blinds. The

buildings are oriented SW, with windows facing in all directions.

The overheating risk that is predicted in the SAP calculations is slight.

10.2. Promoting Heat and Drought resistant planting

The UK's water demand is ever increasing. Therefore, it is essential that landscaping does not use excessive amounts of water. The developer will need to ensure the landscaping of the development does not require excessive amounts of water. Consideration will be given to including plant species which are heat and drought resistant. Advice from an ecologist should ideally be sought before any plant species are selected.

11. Flooding

11.1. Surface Water Flooding

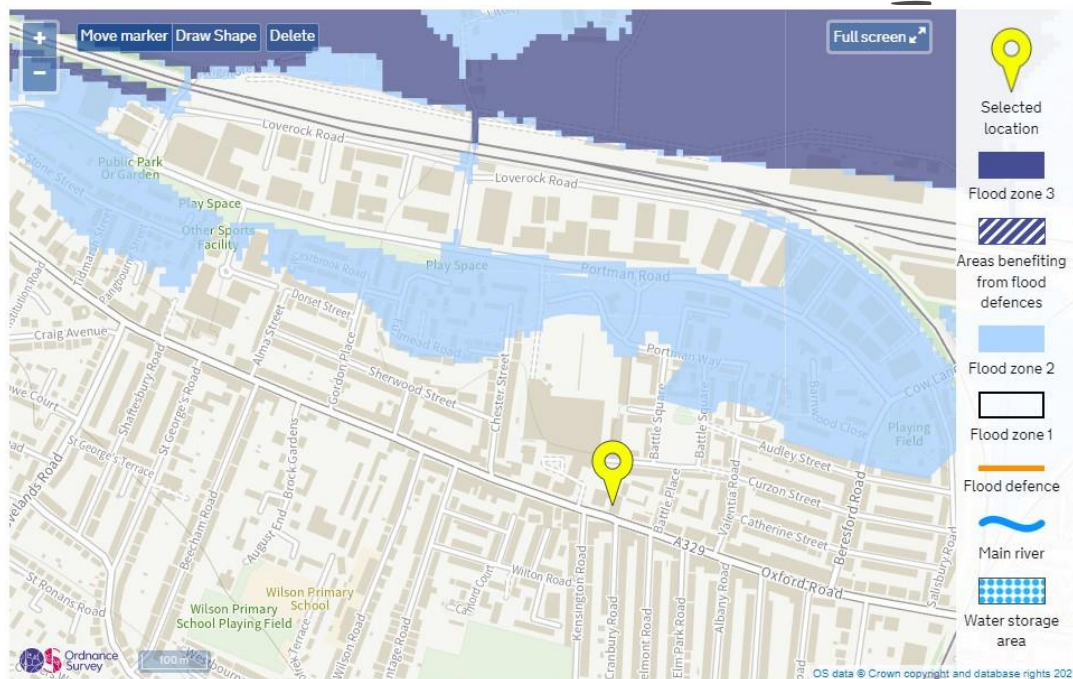
A significant area of land within Reading is at risk of flooding, and this is expected to worsen with the effects of climate change.

All major developments must incorporate sustainable drainage systems (SuDS) as appropriate and in line with the Government's Technical Standards. Runoff rates should aim to reflect greenfield conditions and, in any case, must be no greater than the existing conditions of the site.

Wherever possible, SuDS provision should maximise ecological benefits, link into the existing Green Network, incorporate tree planting and landscaping and avoid damage to existing significant trees, including through changes to the site hydrology. All new developments in areas of flood risk should give priority to SuDS.

11.2. Flooding Resilience and Resistance

The development site is located in a flood zone 1 area, which is low risk, and smaller than 1 hectare, therefore, there is no need to carry out a flood risk assessment.



11.3. Flooding and Basement Developments

There is no basement planned for the proposed development.

12. Land Contamination

12.1. Responsible Person or Organisation

The current site is not identified as being contaminated as a result of previous uses.

12.2. Bioremediation

Not required in this case

13. Air Pollution

13.1. Assessment Requirements

An air quality test could be considered for the proposed development however, the air quality in the area is excellent (with an AQI of $38 < 50$).

13.2. Construction and Demolition

For the proposed development, the contractor will follow advice regarding the control of dust and emissions during the construction process.

Control measures will be implemented by the contractor on site to prevent air and dust pollution. An example of this could be using dust sheets on materials and skips, damping down in waste areas.

13.3. Design and Occupation

Ventilation pathways will need to be designed to reduce the build-up of air pollutants in the premises, through cross ventilation, and natural ventilation. In naturally ventilated buildings: openable windows and or ventilators are over 10m from sources of external pollution.

14. Noise

14.1. Sources of Noise

The proposed site is located within a residential area, with a Tesco Extra and some take away restaurants in the vicinity. The development is identified as having a slight potential for noise pollution since it's located at Oxford Road which is one of the main roads of West Reading.

14.2. Mitigation of Noise emitted by the development

Noise attenuation measures will be incorporated on-site where required, to ensure that any noise generated by equipment or services will not generate a source of noise pollution or negatively impact the surrounding area.

The developer will comply with the council's construction noise rules which states what hours of the day the site can work within.

14.3. Mitigation of Noise impacts on the development

The Proposed Development will seek to reduce noise at source and then design noise out of the scheme to reduce the need for mitigation measures.

The following advise should be followed, and best efforts will be made were possible to avoid impacts of external noise to the building's users.

Locate noise sensitive areas/rooms away from the parts of the site most exposed to noises, create setbacks, design the building so its shape and orientation reflect noise and protect the most sensitive uses and carefully locate noise generating equipment for the building such as plant and services away from sensitive uses.

15. Light Pollution

15.1. Type of Light Pollution

Light pollution comprises any adverse effect of lighting for building occupiers, and for this development includes Glare, 'Light Trespass' and 'Sky Glow', and Poor Artificial Lighting.

15.2. Potential Effects

Light pollution can have a detrimental impact on the quality of life for the building's users; by significantly changing the character of the locality, altering wildlife and ecological patterns, and wasting energy.

15.3. Lighting Design to minimize the impacts

To minimise obtrusive light where applicable, lights will be designed to be used only in appropriate areas, and that upward lighting is minimised, this will help to reduce light pollution and effect the neighbourhood.

Where there is external lighting, it will have to be designed to the following standards.

Firstly, to be energy efficient going beyond Part L of the building regulations, with the aim to achieve no less than 60 lumens per circuit watt.

Secondly, all external lights will be automatically controlled for the prevention of operation during daylight hours and presence detection in areas of intermittent pedestrian traffic. The ILP Guidance for the reduction of obtrusive light, 2001 will be used to design the lighting strategy. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes. Illuminated advertisements, where specified, must be designed in compliance with ILE Technical Report 5 – The Brightness of Illuminated Advertisements

16. Water Pollution

16.1. How Sustainable Drainage contributes to water quality

There are no activities on site which lead to pollutants accumulating on hardstanding areas, therefore traditional drainage systems should be sufficient. Further detail is required by a drainage engineer.

16.2. Connection of New Developments to the Sewer Network

The site has already connection to the main sewer network therefore connection is not a problem.

17. Conclusion

The proposed development is to be located at the Curzon Club, 362 Oxford Rd, Reading, RG30 1AQ.

The proposal is for the formation of a major housing development comprised by 30 flats over 6 floors and a commercial unit located on the ground floor of the development.

Reading Borough's Local Plan 2019 sets out high standards for Sustainability and for all major applications a Sustainability

statement is required to be submitted for planning. This is to be in line with the key principals of the Reading's Local Plan 2019, which requires all major developments to have net Zero carbon standards.

The above sustainability statement sets out what the requirements are of the planning policies and what can be achieved for the proposed development.

The main features of the site to meet the building environmental standards are:

- The energy efficiency measures of the whole development are to go beyond Part L1a 2013, with a carbon emissions improvement of 41.88% which will include renewable technologies.
- The development is to take a fabric first approach, which is to be designed to be highly insulated, with low U-values, good air tightness, high heating efficiency and controls.
- Water efficiency is a big driver of sustainability and indoor fittings which will have water efficiency measures installed. These will help to go beyond Part G minimum standard of 125l/person/day and achieve a 110l/person/day
- Materials to be used in the proposed development are to consist of having a high Green Guide rating, using the BRE Green Guide for reference. All timber used on site is to be sustainably sourced. Where possible recycled aggregates will be used.
- The contractor to be used for this development will need to monitor, record construction site impacts (energy, water and transport), having policies in place for reducing air and surface water pollution.
- The contractor will need to have a site waste management plan in place from the beginning of construction and use this throughout the construction period. Any demolition waste will be recycled.
- The location lends itself to good transport links

18. SAP Calculations – Block Compliance

BLOCK COMPLIANCE		J O S T E C			
Calculation Type: New Build (As Designed)					
Block Reference	22009 - Curzon Club V2	Issued on Date			
Block Name	22009 - Curzon Club V2				
Assessor Details	Mr. Mohamed Egal, Mohamed Egal, Tel: 01923 518 923, mohamed@jostec.co.uk	Assessor ID	H664-0001		
Client					
Block Compliance Report - DER					
Block Reference: 22009 - Curzon Club V2		Block Name: 22009 - Curzon Club V2			
Property-Assessment Reference	Multiplier	Floor Area (m²)	DER (kgCO ₂ /m²)	TER (kgCO ₂ /m²)	% DER/TER
22009 - Flat 01-As Designed V2	1	50.56	11.53	22.87	49.58 %
22009 - Flat 02-As Designed V2	1	70.12	9.33	18.50	49.56 %
22009 - Flat 03-As Designed V2	1	47.15	9.03	20.26	55.43 %
22009 - Flat 04-As Designed V2	1	64.6	7.41	15.89	53.38 %
22009 - Flat 05-As Designed V2	1	75.39	10.78	18.69	42.33 %
22009 - Flat 06-As Designed V2	1	69.47	9.92	19.04	47.89 %
22009 - Flat 07-As Designed V2	1	53.63	10.71	21.74	50.73 %
22009 - Flat 08-As Designed V2	1	50.56	9.72	19.98	51.35 %
22009 - Flat 09-As Designed V2	1	70.12	7.49	15.95	53.05 %
22009 - Flat 10-As Designed V2	1	47.15	6.55	16.95	61.35 %
22009 - Flat 11-As Designed V2	1	64.6	7.25	15.71	53.86 %
22009 - Flat 12-As Designed V2	1	75.39	8.91	16.04	44.46 %
22009 - Flat 13-As Designed V2	1	69.47	7.81	16.16	51.68 %
22009 - Flat 14-As Designed V2	1	53.63	8.27	18.48	55.24 %
22009 - Flat 15-As Designed V2	1	50.56	9.72	19.98	51.35 %
22009 - Flat 16-As Designed V2	1	70.12	11.12	20.17	44.87 %
22009 - Flat 17-As Designed V2	1	47.15	6.55	16.95	61.35 %
22009 - Flat 18-As Designed V2	1	64.6	7.30	15.83	53.89 %
22009 - Flat 19-As Designed V2	1	75.39	8.91	16.04	44.46 %
22009 - Flat 20-As Designed V2	1	69.47	7.81	16.16	51.68 %
22009 - Flat 21-As Designed V2	1	53.63	8.27	18.48	55.24 %
22009 - Flat 22-As Designed V2	1	50.56	11.27	21.93	48.61 %
22009 - Flat 23-As Designed V2	1	47.15	11.29	22.50	49.81 %
22009 - Flat 24-As Designed V2	1	64.6	11.08	19.84	44.15 %
22009 - Flat 25-As Designed V2	1	75.39	8.91	16.04	44.46 %
22009 - Flat 26-As Designed V2	1	69.47	7.81	16.16	51.68 %
22009 - Flat 27-As Designed V2	1	53.63	8.27	18.48	55.24 %
22009 - Flat 28-As Designed V2	1	75.39	13.03	20.85	37.50 %
22009 - Flat 29-As Designed V2	1	69.47	11.55	20.06	42.42 %
22009 - Flat 30-As Designed V2	1	53.63	10.09	20.12	49.84 %
Totals:	30	1852.05	277.69	555.85	
Average DER = 9.28 kgCO ₂ /m²		% DER/TER		PASS	
Average TER = 18.35 kgCO ₂ /m²		49.43 %			

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

J O S T E C

Block Compliance Report - DFEE

Block Reference: 22009 - Curzon Club V2		Block Name: 22009 - Curzon Club V2			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
22009 - Flat 01-As Designed V2	1	50.56	52.04	64.69	19.55 %
22009 - Flat 02-As Designed V2	1	70.12	37.04	49.00	24.42 %
22009 - Flat 03-As Designed V2	1	47.15	39.09	46.61	16.13 %
22009 - Flat 04-As Designed V2	1	64.6	29.03	34.83	16.63 %
22009 - Flat 05-As Designed V2	1	75.39	42.90	51.46	16.65 %
22009 - Flat 06-As Designed V2	1	69.47	38.32	51.06	24.94 %
22009 - Flat 07-As Designed V2	1	53.63	45.07	58.16	22.50 %
22009 - Flat 08-As Designed V2	1	50.56	44.40	49.77	10.77 %
22009 - Flat 09-As Designed V2	1	70.12	28.59	35.90	20.36 %
22009 - Flat 10-As Designed V2	1	47.15	27.74	29.56	6.16 %
22009 - Flat 11-As Designed V2	1	64.6	28.31	33.92	16.54 %
22009 - Flat 12-As Designed V2	1	75.39	34.28	37.92	9.61 %
22009 - Flat 13-As Designed V2	1	69.47	28.71	36.38	21.08 %
22009 - Flat 14-As Designed V2	1	53.63	34.16	41.59	17.86 %
22009 - Flat 15-As Designed V2	1	50.56	44.40	49.77	10.77 %
22009 - Flat 16-As Designed V2	1	70.12	44.04	56.28	21.75 %
22009 - Flat 17-As Designed V2	1	47.15	27.74	29.56	6.16 %
22009 - Flat 18-As Designed V2	1	64.6	27.77	33.73	17.69 %
22009 - Flat 19-As Designed V2	1	75.39	34.28	37.92	9.61 %
22009 - Flat 20-As Designed V2	1	69.47	28.71	36.38	21.08 %
22009 - Flat 21-As Designed V2	1	53.63	34.16	41.59	17.86 %
22009 - Flat 22-As Designed V2	1	50.56	51.49	59.74	13.81 %
22009 - Flat 23-As Designed V2	1	47.15	52.66	60.73	13.29 %
22009 - Flat 24-As Designed V2	1	64.6	44.70	53.79	16.91 %
22009 - Flat 25-As Designed V2	1	75.39	34.28	37.92	9.61 %
22009 - Flat 26-As Designed V2	1	69.47	28.71	36.38	21.08 %
22009 - Flat 27-As Designed V2	1	53.63	34.16	41.59	17.86 %
22009 - Flat 28-As Designed V2	1	75.39	54.45	63.66	14.47 %
22009 - Flat 29-As Designed V2	1	69.47	45.91	56.34	18.51 %
22009 - Flat 30-As Designed V2	1	53.63	42.28	49.89	15.25 %
Totals:	30	1852.05	1,139.44	1,366.14	
Average DFEE = 37.72 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 45.33 kWh/m ² /yr		16.79 %			

19. SBEM Calculations

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	13.18	23.01
Cooling	0	0
Auxiliary	0.13	0
Lighting	30.69	48.23
Hot water	1.36	1.57
Equipment*	16.26	16.26
TOTAL**	45.36	72.81

* 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	6.65	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	237.92	314.73
Primary energy* [kWh/m ²]	139.25	171.41
Total emissions [kg/m ²]	20.1	32.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.