Energy and Sustainability Statement

London Square & Ascot Central Car Park Limited

Site South of High Street
Ascot

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The figures within this report may be based on indicative modelling and an assumed specification outlined within the relevant sections. Therefore, this modelling may not represent the as built emission or energy use of the Proposed Development and further modelling may need to be undertaken at detailed design stage to confirm precise performance figures. Please contact SRE should you have any questions, or should you wish further modelling to be undertaken post planning.

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Executive Summary

This Energy and Sustainability Statement has been written to demonstrate the measures incorporated into the design of the Proposed Development at the Site South of High Street, Ascot, which will deliver lower energy and water use, lower carbon emissions and lower operational costs than a 2021 Building Regulations compliant design.

The energy strategy for the Proposed Development has been developed by following the nationally recognised Energy Hierarchy of Lean, Clean, Green and Seen. The chosen energy strategy includes Lean passive and active design measures and Green low and zero carbon (LZC) technologies to reduce lobal warming potential (GWP) carbon dioxide equivalent (CO_2e) emissions in line with the Royal Borough of Windsor and Maidenhead Local Plan. The Proposed Development has aimed to achieve net zero carbon where feasible, with a minimum 12% of the total energy demand met by on-site renewables.

Proposed Energy Strategy

- Enhanced building fabric and accredited construction detailing
- Low emissivity (Low-E) Triple glazing and suitable G-values
- Passive and active design measures
- 100% low energy lighting
- Balanced mechanical ventilation with heat recovery (MVHR)
- Additional mechanical purge ventilation within certain occupied rooms to comply with Part O[1]
- Low-temperature flow, Appendix Q rated, Air Source Heat Pumps (ASHPs)
- Proposed 198.72kWp solar photovoltaic (PV) system site wide.

This scheme has been able to achieve an 70.18% improvement in CO_2e emissions, as shown in Table 1 compared to a 2021 Building Regulations compliant scheme, with LZC technologies contributing >12% to the total energy demand onsite.

Site-Wide	CO_2e emissions ($kgCO_2e/m^2$)	Improvement (%)
Baseline[2]	11.67	-
Green	3.48	70.18

Table 1 - Summary of indicative site-wide regulated CO_2e savings

Through a considered approach to sustainability, the Proposed Development is aiming to deliver a highly sustainable mixed-use development which is within an appropriate area for this use and at an appropriate scale. The Proposed Development will make maximum use of the Application Site, providing a mixture of individual houses, flats and commercial space, in-line with the Adopted Royal Borough of Windsor and Maidenhead Local Plan requirements.

[1] Specific rooms outlined in SRE Thermal Comfort Assessment
[2] Baseline model includes PV

The adoption of a sustainable approach to the design and construction has allowed the Proposed Development to provide:

- Development which is suitable for the site with access to public transport and services
- Low internal water use
- Low impact development with minimal noise, light and air pollution
- Consideration of biodiversity on the site within the landscaping design
- Comprehensive site waste management during construction and operation.

Introduction

1.0 Introduction

This Energy and Sustainability Statement has been written by SRE on behalf of London Square & Ascot Central Car Park Limited (the Client) to demonstrate the measures incorporated into the design of the Site South of High Street, Ascot (the Proposed Development) which will deliver lower energy and water use, lower carbon emissions and lower operational costs than a 2021 Building Regulations compliant design.

The statement compares the predicted actual building energy requirement with a 2021 Building Regulations compliant design, outlines passive and active design measures, and assesses the suitability of low and zero carbon (LZC) technologies specific to this site to address the relevant planning policy requirements.

The statement analyses how the Proposed Development will integrate with its surrounding environment within the context of sustainability to ensure it benefits the surrounding area socially, environmentally and economically.

The Proposed Development is a mixed-use development, consisting of 2,077.4m^2 commercial including community floorspace and 117 dwellings.

The site is located in Ascot, South of the High Street and East of Station Hill. Figure 1 shows the elevations of one of the buildings of the Proposed Development. See Appendix A for the full site plan.

Figure 1 – Elevations of Apartment Block 2 of Proposed Development (DHA Architecture Ltd)

Table 2 lists the relevant policy requirements applicable to the Proposed Development.

Planning Policy	Requirement
Royal Borough of Windsor and Maidenhead Local Plan (2013-2033)	<u>Objective 11: Climate Change and Biodiversity</u> New developments should: (i) Promote sustainable design and construction (ii) Promote the use of renewable energy (iii) Manage flood risk through the location and design of the development <u>Policy EP 1: Environmental Protection</u> Development proposals will only be supported where it can be shown that either individually or cumulatively in combination with other schemes, they do not have an unacceptable effect on environmental quality or landscape, both during the construction phase or when completed. Development proposals should seek to conserve, enhance and maintain existing environmental quality in the locality, including areas of ecological value (land and water based), and improve quality where possible, both during construction and upon completion. Opportunities for such should be incorporated at the design stage and through operation. <u>Policy EP 2: Air Pollution</u> Development proposals which may result in significant increases in air pollution must contain appropriate mitigation measures. Development proposals should show how they have considered air quality impacts at the earliest stage possible; where appropriate through an air quality and transport assessment which should include cumulative impacts. <u>Policy EP 3: Light Pollution</u> Development proposals should seek to avoid generating artificial light pollution where possible. <u>Policy EP 4: Noise</u> Development proposals should consider the noise and quality of life impacts on recipients in existing nearby properties and also the intended new occupiers ensuring they will not be subjected to unacceptable harm. <u>Policy IF 2: Sustainable Transport</u> Development proposals should show how they have provided car and cycle parking in accordance with the current Parking Strategy, including disabled parking spaces, motorcycle parking and cycle parking.

<table>
<tr><th>Position Statement</th><th>Guidance</th></tr>
<tr><td>Royal Borough of Windsor and Maidenhead Planning Position Statement on Sustainability and Energy Efficient Design (March 2021)</td><td>All developments proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:
1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

All developments should be net zero carbon unless it is demonstrated this would not be feasible.

There is an expectation that developments maximise renewable energy generation regardless of whether minimum standards are met through other measures, as such there is an expectation 12% of the total energy demand will be met by on-site renewables, unless this is demonstrated to be unfeasible.

The net-zero carbon outcome should be achieved on-site where feasible. Where it is demonstrated that this outcome cannot be fully achieved onsite, any shortfall may be provided through a cash in lieu contribution to the Boroughs Carbon Offset Fund.

20% of new car parking spaces will be provided with active EV charging facilities – and passive provision (the ducting, cabling, and capacity within the Mechanical and Engineering Services) for the remaining 80% of spaces will be provided.

Development should minimise the use of mains water by:

a. incorporating water saving measures and equipment

b. designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day (excluding an allowance of 5 litres or less per head per day for external water consumption).</td></tr>
</table>

Table 2 - Summary of local planning policy requirements

The Proposed Development will meet the requirements as set out in the Royal Borough of Windsor and Maidenhead Local Plan and have regard to the Council’s Position Statement on Sustainability which sets out the Council’s action plan for sustainable development. The Proposed Development will therefore aim to achieve net zero carbon where feasible, with a minimum 12% of the total energy demand met by on-site renewables.

Energy

2.0 Energy

2.1 Method

The energy strategy design follows national policy guidance[3] and seeks to be:

Lean

Minimise the overall environmental impact and energy use through energy efficiency measures

Clean

Ensure that energy systems on-site (heat & power) are efficient & produce minimal CO_2e emissions

Green

Implement suitable technologies to provide renewable and emission free energy sources

Seen

Incorporate monitoring through SMART metering and accessible displays

The CO_2e Conversion Factors have been taken from the new Building Regulations 2021 which are based on standard yearly figures taken from the Government SAP Guidance[4] and outlined below in Table 3. Within the SAP10 modelling, the CO_2e conversion factor for electricity vary over the course of the year due to the changing mix of inputs to the electricity grid, i.e., increased solar photovoltaic (PV) generation in the summer months.

Source	CO_2e Conversion Factor ($kgCO_2e/kWh$)
Electricity (mains)	0.136
Electricity (offset)	-0.136
Gas (mains)	0.210

Table 3 - CO_2e conversion factors by energy source

The energy modelling for the residential elements has been calculated using SAP 10 software in accordance with 2021 Building Regulations Part L V1.

The non-residential elements of the development have been assessed with Integrated Environmental Solutions Virtual Environment (IES VE) 2022 modelling software in accordance with 2021 Building Regulations Part L V2.

Indicative modelling has been performed at this stage in the project timeline, with 2 no. sample commercial units (Office & Residential unit) and 13 no. sample residential units assessed. A mixture of unit types and sizes

[3]The New London Plan https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan
[4] The Government Standard Assessment Procedure for Energy Rating of Dwellings Version 10.2 (Table 12, Pg 182): https://files.bregroup.com/SAP/SAP%2010.2%20-%2017-12-2021.pdf

have been selected for this modelling, with the results then extrapolated for the whole site (2,980m^2 of commercial floorspace and 117 no. residential dwellings), to give an indication of the site wide CO_2e emissions for the different energy scenarios. The 'Green' scenario presents the proposed energy strategy for the Proposed Development.

2.2 Baseline Emissions

During the modelling, the proposed model is compared against a notional model, which the Proposed Development must improve upon to achieve Building Regulations Compliance. The notional buildings provide the energy baseline and are the exact size and shape of the Proposed Development but are based on notional U-values and heating specifications outlined in Approved Document L and the Domestic and Non-Domestic Building Services Compliance Guides.

The Baseline represents the minimum compliance level in terms of Target Emissions Rate (TER) and Target Fabric Energy Efficiency (TFEE) of the Proposed Development, with all improvements measured from this level. Table 4 gives the indicative site-wide Baseline emissions & Fabric performance for the residential element, based on the extrapolation of the results of the indicative, sample modelling.

	Energy Hierarchy	CO_2e emissions ($kgCO_2/m^2$)	Fabric Energy Efficiency ($kWh/m^2/yr$)
Residential	Baseline	11.67	39.98
Commercial	Baseline	2.55	-

Table 4 - Baseline CO_2e emissions and Fabric Energy Efficiency (Site-Wide)

2.3 LEAN – Demand Reduction

Passive and active design measures have been incorporated as part of the Lean scenario, resulting in a 2.78% improvement in fabric energy efficiency above the Baseline scenario for the residential element, as shown in Table 5 and Table 6.

Scenario	Energy Hierarchy	CO_2e emissions ($kgCO_2/m^2$)	Improvement (%)	Fabric Energy Efficiency (FEE) ($kWh/m^2/yr$)	Improvement (%)
Residential	Baseline	11.67		39.98	
	Lean	9.73	16.62	41.13	2.78

Table 5 - Lean CO_2e emissions and Fabric Energy Efficiency over Baseline (Residential)

Scenario	Energy Hierarchy	CO_2e emissions ($kgCO_2/m^2$)	Improvement (%)
Commercial	Baseline	2.55	
	Lean	6.28	-146.28

Table 6 – Lean CO_2e emissions over Baseline (Commercial)

For the non-residential aspects, the 'Lean' scenario performs worse than the notional since electric panel heaters were modelled to provide 100% of space heating. However, 'Lean' measures have been maximised where feasible, including highly efficient building fabric with proposed U-values, high efficiency light emitting diode (LED) lighting with passive infrared (PIR) and daylight sensors in communal spaces, highly efficient Mechanical ventilation with heat recovery (MVHR) systems to all occupied spaces and increased thermal mass among the proposed 'Lean' measures. The CO_2e emissions from the Baseline scenario will therefore be used to show a 12% improvement against the Proposed Development using LZC technologies in Section 2.5 – Green scenario.

In the 2021 building regulations the notional building contains PV equivalent to 40% of the floor area. However, within the Lean scenario, the Proposed Development is to demonstrate the potential CO_2e savings achieved using passive and active measures such as through improved fabric performance. The Greater London Authority (GLA) Carbon Emission Reporting Spreadsheet standardises the allocated PV in both the notional and 'Lean' building scenarios in order to accurately demonstrate the savings made by the 'Lean' measures. Despite not being in the GLA, this spreadsheet has been used to demonstrate the effect that the proposed passive and active measures have over the notional building.

2.3.1 Passive Design Measures

The buildings have been positioned within the site to maximise the usable space, both for the buildings and the external spaces. All glazed areas of the buildings will have elements of shading provided by the buildings' form or internal curtains or blinds. The Proposed Development has been orientated and designed to maximise natural light and positive solar gains, whilst balancing the risks of overheating. The majority of the units will have an East-West aspect, allowing good amounts of solar gain whilst minimising potential overheating by having limited glazing directly facing the stronger, southern sun. Solar gains will be further controlled through the specification of low emissivity (Low-E) glazing.

The Proposed U-values are provided within Table 7. The overall buildings should have a medium thermal mass as construction will consist of load-bearing masonry. A medium thermal mass will balance providing high energy efficiency and limiting overheating during the summer months.

Element	Proposed - Commercial (U-value)	Proposed – Flats & Houses (U-value)
External Walls	0.14	0.18
Heat Loss Floors	0.13	0.11
Roofs	0.13	0.13
Windows and rooflights	1.00	0.8-1.20

Element	Proposed - Commercial (U-value)	Proposed – Flats & Houses (U-value)
External Doors	1.00	1.00
Air Tightness @ 50 N/m^2	5 ($m^3/hr/m^2$)	5 ($m^3/hr/m^2$)
Thermal Bridge	NCM Compliant Bridging	Notional Psi Values

Table 7 - Fabric energy efficiencies

2.3.2 Active Design Measures

The Proposed Development will utilise 100% low energy/LED lighting in excess of 2021 Building Regulation requirements. All external lighting will be positioned to avoid excessive light pollution and be supported by PIR/daylight sensor and time controls with a maximum lamp capacity of 150lm/W (equivalent) for essential security lighting.

Controls will be provided to all spaces that allow the controlling and programming of temperatures within the space. The commercial aspect of the development will be provided with central time and temperature zone control as well as weather compensators for heating and cooling systems. Likewise, the individual houses will be provided with time and temperature zone controls, whereas the flats will use programmers and room thermostats since zonal control will not be appropriate due to their size.

In modern air-tight buildings, careful consideration needs to be given to the specification of ventilation systems to ensure moisture is removed and ventilation standards are met to ensure a healthy standard of internal air. For both the residential units and commercial space, balanced mechanical ventilation with heat recovery (MVHR) is proposed which gives good levels of air change and improves air quality, whilst minimising heat losses. Additional mechanical purge ventilation will be provided to specific occupied rooms to reduce the risk of overheating as outlined in the SRE Thermal Comfort Assessment. Openable windows will also provide purge ventilation when required.

2.3.3 Cooling

The cooling hierarchy, shown in Table 8, has been used to ensure that passive building design has been optimised to reduce the cooling load for the Proposed Development in commercial units. During the summer at times of high temperatures, cooling systems in commercial units would provide cool, fresh air to the occupants.

Cooling Hierarchy	Potential Design Measures
Minimising internal heat generation through energy efficient design	All primary pipework to be insulated, therefore low system losses. High specification hot water cylinders installed with low heat loss. Low energy lighting throughout.

Cooling Hierarchy	Potential Design Measures
Reducing the amount of heat entering the building in summer	Low E glass windows and internal blinds are to be provided to minimise solar gain. All walls are to be well insulated.
Use of thermal mass and high ceilings to manage the heat within the building	Thermal mass is anticipated to be medium with some element of exposed mass.
Passive Ventilation	Openable windows provided which will be used for purge ventilation to reduce the risk of overheating.
Mechanical Ventilation	Balanced Mechanical Ventilation with Heat Recovery is proposed, with automatic summer bypass. Additional mechanical purge ventilation provided to certain occupied rooms to further reduce the overheating risks – outlined in SRE Thermal Comfort Assessment.

Table 8 - Design measures following the cooling hierarchy

For the residential units, an overheating risk assessment has been carried out to demonstrate compliance with requirement O1 in line with Building Regulations 2021. The results of the assessment are included in the Thermal Comfort Assessment (Part O & CIBSE TM59) produced by SRE and show that all assessed units comply with the Part O1 requirements.

For the commercial area, active cooling is proposed via a variable refrigerant flow (VRF) system ceiling cassettes or wall mounted units that can provide both heating and cooling for the scheme. For heating the corridors, panel heaters have been proposed.

Within the proposed residential units, active cooling has been proposed for buildings where high acoustic levels restrict window openings, this is discussed further in the Thermal Comfort Assessment.

2.4 CLEAN – Heating Infrastructure

Although connection of the Proposed Development to a district heating system is not currently feasible, the installation of a wet system will allow for future connection should a district heating network become available. Although the proposed development could feasibly install a communal gas boiler system, this would likely cause an increase in emissions compared to the 'Lean' scenario and thus has not been assessed.

2.5 GREEN – Low Carbon and Renewable Energy

The addition of 'Green' technologies can provide a site-wide 70.18% reduction in CO_2e emissions over Baseline emissions in line with the Royal Borough of Windsor and Maidenhead Local Plan.

Individual air-to-water air source heat pumps (ASHPs) have been proposed for all houses, and communal ASHPs for the flats. This replaces the gas-fired boilers modelled within the 'Lean' scenarios. Air-to-air heat pumps have been proposed for the commercial units, supplying the retail, office and community cultural spaces. Panel heaters will provide space heating to the corridors and instantaneous electric hot water to the communal water closets (WCs). A total 198.72kWp PV system will provide additional CO_2e offset onsite. The proposed energy strategy therefore exceeds the 12% requirement of energy demand being supplied by renewable technologies onsite. Further information is presented in Table 9, Table 10 and Table 11.

	Energy Hierarchy	CO_2e emissions ($kgCO_2/m^2$)	Improvement (%)
Residential	Baseline	11.67	
	Green	3.48	70.18

Table 9 - Green CO_2e emissions and improvement over Baseline

	Energy Hierarchy	CO_2e emissions ($kgCO_2/m^2$)	Improvement (%)
Residential	Lean	11.67	
	Green	3.48	70.18
Commercial	Baseline	2.55	
	Green	-0.62	124.31

Table 10 - Green CO_2e emissions using LZC technologies

	Energy Hierarchy	Primary Energy Rate (PER) ($kWh/m^2/yr$)	Improvement (%)
Residential	Target	61.06	
	Green	36.42	40.35

Table 11 – Primary Energy Rate of the Proposed Development

2.5.1 Air Source Heat Pumps (ASHPs)

The use of heat pumps (HPs) is often the most direct method of reducing CO_2e emissions for a Proposed Development with minimal change in aesthetics or the way in which a building is designed. Often a 'straight swap' alternative for a gas system boiler, the use of HPs has the potential to provide significant offset in CO_2e emissions.

All HP systems consume electricity to operate - the Coefficient of Performance (CoP) of the system is the ratio of heat energy emitted to electrical energy consumed. Generally, a CoP of 3 or 4 can be achieved, meaning 3 or 4 units of thermal energy are produced for each unit of electricity consumed.

HPs will only deliver low grade heat (up to circa 55°C) efficiently, and therefore HP systems alone are generally relatively inefficient in providing hot water, as this requires additional electrical input (immersion or increased compressor use).

Air-to-water communal heat pumps are proposed for the residential units providing space heating and domestic hot water (DHW). High efficiency hot water cylinders would also be required – with immersion top-up – to store and heat the DHW as needed. This has been modelled as individual systems for the houses and communal systems for the flats, in order to maximise the efficiency of the systems.

For the commercial areas, a centralised plant will provide heating and cooling for the scheme via ASHPs. An air-to-air, variable refrigerant flow (VRF) heat pump system has been proposed, providing space heating and cooling through ceiling cassettes; however, in the corridors of commercial building, electric panel heaters would be installed due to their compact design and fast heat dissipation.

ASHPs tend to generate some noise and therefore the location/space in which the pump is positioned would need to be adequately sound insulated or appropriately located to prevent disturbances to the occupants of these and/or neighbouring buildings.

2.5.2 Photovoltaics (PV)

Photovoltaic (PV) panels convert energy from daylight into direct (DC) electrical current. These are generally roof mounted and provide electrical generation which can either be utilised directly on-site (or nearby), stored in batteries, or exported back to the National Grid.

The installation of PV will be used to offset electrical demand within the Proposed Development. The PV array would be connected into the electrical system via an inverter or series of inverters, depending on system size and setup.

Noise will not be an issue – A PV system does not feature moving parts and is silent during operation.

For the purposes of this report, a 345W module will be used as an example of a standard module, each panel covers an area of circa 1.7m^2 (1.7m x 1m). For the commercial units, a 117.99kWp PV system has been proposed which is equivalent to 342 no. panels. For the residential aspect, an approximate 0.69kWp system has been proposed for each unit, with a total of 234 no. panels.

Where the indicative sample units have sloped roofs or flat roofs, a 30 degree or 15^o PV pitch has been modelled respectively. The majority of the sloped roofs have an East-West pitch orientation; therefore, the PV calculations are based on this. For the flat roofs the calculations of PV have been based on a south orientated array, since the array can be freely orientated, and this is the optimum performing orientation due to the sun's path across the southern sky.

Table 12 details the proposed PV array. It can be seen that to achieve net zero carbon, the Proposed Development will require a total PV area of 979.2m^2 equivalent to 576 no. standard 345W panels.

Commercial or Residential	Proposed Array (kWp)	Approximate no. Panels @345W	Active Area (m^2)	Energy Generated (kWh/yr)
Residential	80.73	234	397.80	69,720
Commercial	117.99	342	581.40	101,898

Table 12 - Proposed PV Array Summary

2.5.3 Energy Storage

Whilst the Proposed Development could include battery energy storage, it is believed that the PV generation will not exceed usage at the site, therefore it is unlikely that generation would not be used on-site.

2.6 SEEN – In-use monitoring

It is recommended that the Proposed Development will be supplied with Smart Meters (where available from the utility supplier) and building energy management systems (BEMS) along with associated internal energy displays. This will further improve energy efficiency by allowing building managers and residents to observe their energy use in 'real time' and manage it more effectively.

2.7 Conclusions

The Proposed Development will deliver passive and active energy demand reduction measures along with LZC technologies in order to reduce energy demand and associated CO_2e emissions resulting from the Proposed Development's operation. This includes the installation of high efficacy LED lighting and MVHR system for ventilation.

The calculations undertaken demonstrate that the Proposed Development will successfully exceed 2021 Building Regulations Part L and aligns with the local planning policy.

High efficiency ASHPs have been proposed for the residential and commercial units to provide heating and hot water, and electric panel heaters have been proposed to provide space heating in corridors. Through the proposal of a 198.72kWp PV system, and the use of ASHPs for hot water, a CO_2e offset of 70.18% can be achieved from the use of on-site low and zero carbon technology.

	Energy Hierarchy	CO_2e emissions ($kgCO_2e/m^2$)	Improvement (%)
Site-wide	Baseline	11.67	
	Green	3.48	70.18

Table 13 - Summary of indicative site-wide CO_2e emissions and improvement over Baseline

In delivering the Green energy strategy, the Proposed Development provides:

- Enhanced building fabric and accredited construction detailing
- Low-E Triple glazing and suitable G-values
- Passive and active design measures
- 100% low energy lighting
- Balanced MVH
- Additional mechanical purge ventilation within certain occupied rooms to comply with Part O[5]
- Low-temperature flow, Appendix Q rated, ASHPs
- Proposed 198.72kWp PV system site wide.

[5] Specific rooms outlined in SRE Thermal Comfort Assessment

Sustainability

3.0 Sustainability

The World Commission on Environment and Development (WCED) report: Our Common Future, describes Sustainable Development as development that:

"meets the needs of the present without compromising the ability of future generations to meet their own needs."

The planning system focuses on three objectives to achieve a sustainable development: economic, social, and environmental. These objectives mutually support each other and have been adapted in this statement to meet the objectives of the Royal Borough of Windsor and Maidenhead Local Plan. The current local plan prioritises promoting development that makes the best use of resources, increase the sustainability of the local communities and are adaptable to climate change. Careful considerations have been taken to ensure the Proposed Development meets these expectations.

3.1 Pollution

3.1.1 Air

Poor specification of resources as part of the construction process can have a major environmental impact both in terms of the resources' manufacturing process, but also in terms of transport of the resources to site. Therefore, it is recommended that emissions related to building specifications and their transportation to the construction site are limited as much as practicable.

As standard practice, all insulation on the site will have an Ozone Depletion Potential (ODP) of zero, and a Global Warming Potential (GWP) of less than 5, further minimising the Proposed Development's effect on global Climate Change.

The Proposed Development will aim to limit its contribution to local air pollution by installing ASHPs to provide heating and hot water, in addition to the installation of PV. The ASHPs will emit no onsite NO_X emissions but will consume grid electricity (when not consuming electricity generated by the PV). As the nitrogen oxides (NO_x) emissions resulting from the production of electricity decreases at the national scale, the resulting theoretical emissions from the Proposed Development will do also. Furthermore, the use of PV panels will decrease the import of electricity from the national grid and replace it with PV generated electricity which produces no emissions during operation. Electric Vehicle charging and cycle parking is also being provided for the scheme, which encourages the use of vehicles that emit no NOx or PM emissions.

The Proposed Development is located within a high NO_x emissions area as defined by the UK NO_x emissions map, see Figure 2.

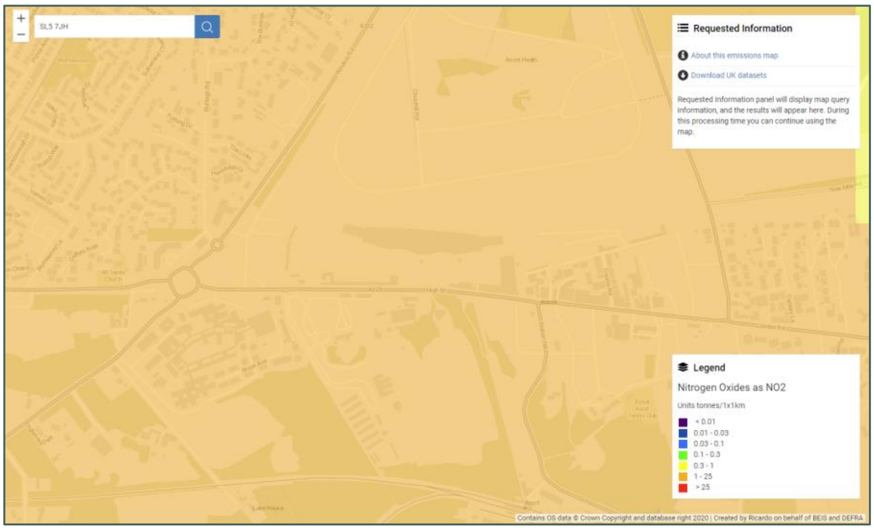


Figure 2 - UK Air Pollution Map showing pollution from NO_x as NO_2 (https://naei.beis.gov.uk/emissionsapp/)

Air pollution will be reduced as much as practicable during construction and new materials will be sourced locally where possible to reduce air pollution associated with the transport of materials. Dust management will also be extremely important for controlling air quality onsite during construction and mitigation measures such as soft stripping or water suppression to damp down dust will be implemented where necessary. Figure 3 shows the UK Air Pollution from particulate matter 10 micrometres (PM10) in the area of the Proposed Development.

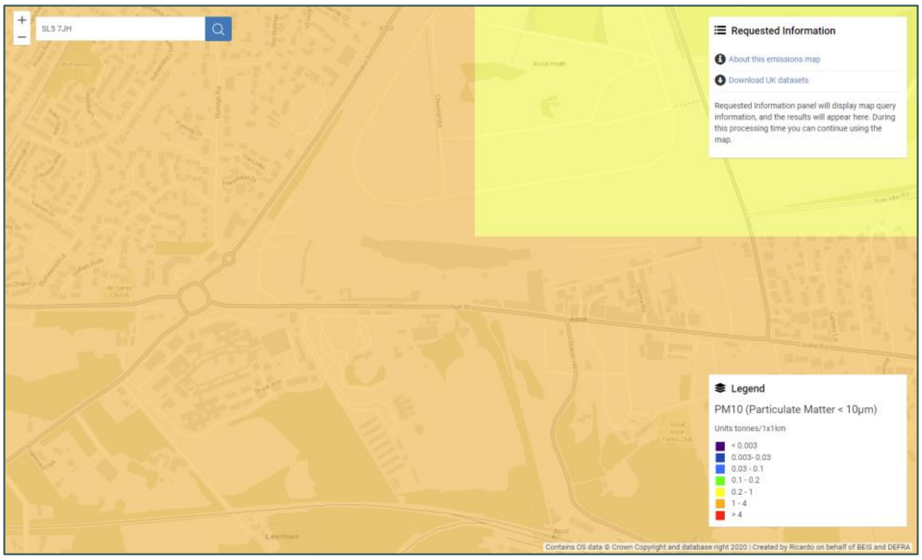


Figure 3 - UK Air Pollution Map showing pollution from PM10 (https://naei.beis.gov.uk/emissionsapp/)

The Redmore Environmental Air Quality Assessment indicates that the impact on air quality during construction, operation and End of life stage will not be significant enough to raise concerns for the various receptors.

3.1.2 Noise

The Proposed Development will have mitigation measures in place to ensure any noise pollution generated from the site will be limited.

Firstly, the buildings of the Proposed Development will be well insulated with excellent airtightness which should limit any noise from inside the buildings.

The positioning of any equipment for the Proposed Development will be carefully considered to avoid nuisance to the surrounding new/existing dwellings. This will include the positioning of ASHP external condenser units which will need to be placed considerately to avoid any inadvertent noise intrusion into habitable spaces.

The provision of electric vehicle charging, and cycle parking also encourages the use of electric cars and bicycles, which are quiet in operation compared to traditional cars with petrol/diesel engines.

3.1.3 Light

The design and layout of the site for practical use has been considered while trying to maximise internal daylight levels. All spaces occupied by residents have glazing to provide natural daylight, and light-coloured curtains or roller blinds will be provided to enable glare control and privacy.

Light Pollution will be minimised where possible through the careful specification and positioning of external lighting around the Proposed Development, ensuring minimal light pollution from the site. Special attention will be given to security lighting (where fitted) to ensure it is appropriately focussed and controlled.

All external space lighting will be provided through low energy fittings, with security lighting being PIR and daylight/timer controlled. Any external signage, where installed and lit, will be installed and controlled in-line with best practice.

3.2 Flood Risk

The selected site is at very low risk of flooding from rivers and seas as shown in Figure 4 and low risk of flooding from surface water as shown in Figure 5. Despite this, Sustainable Drainage Systems (SuDS) will be implemented at the proposed site, details are covered within the reports prepared by Barnard & Associates.

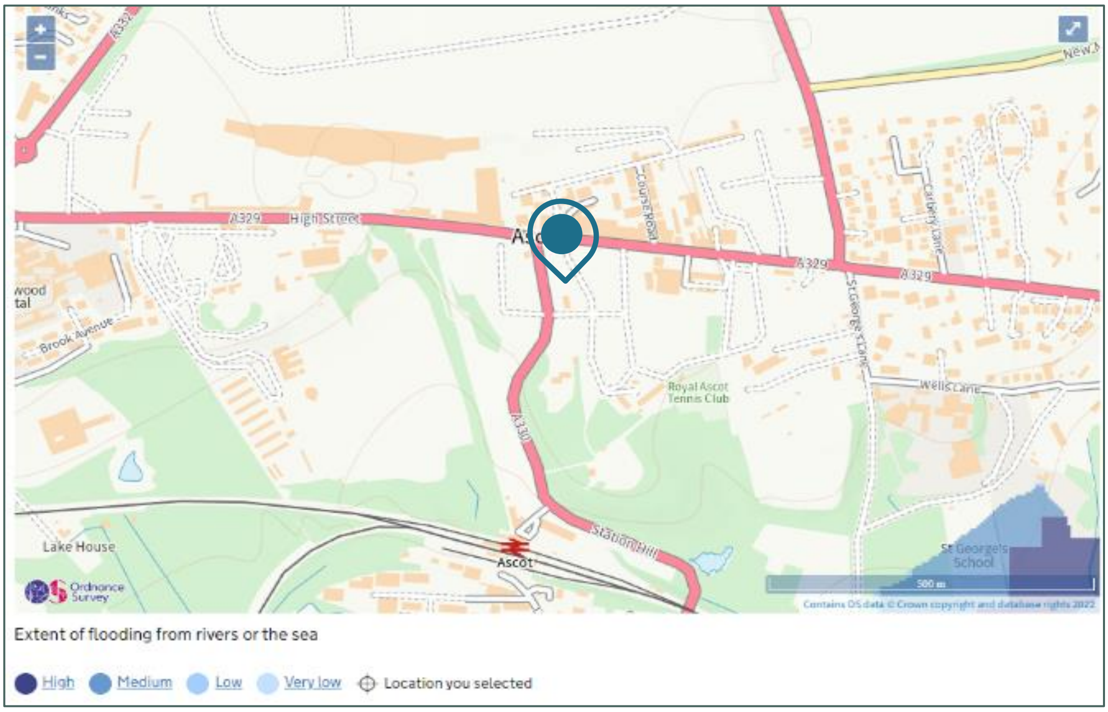


Figure 4 - Flood map showing risk of flooding from rivers or the sea (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

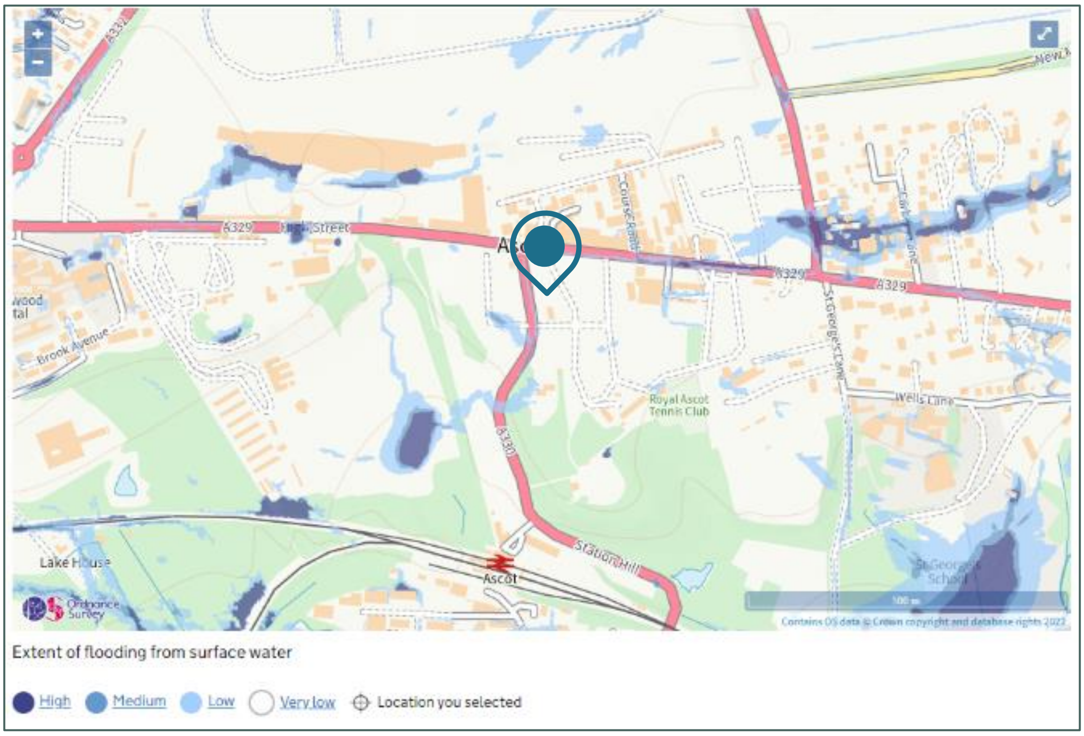


Figure 5 - Flood map showing risk of flooding from surface water
(https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

3.3 Transport

3.3.1 Public Transport

The Proposed Development is less than 500m from Ascot Railway Station. This station is on the London Waterloo to Reading line, with a basic service every 30 minutes, 7 days a week. Trains also run to Aldershot every 30 minutes, Monday to Saturday, and to Guildford on Sundays along the same line.

The Proposed Development is also located less than 100m from the closest bus stops on the High Street. The buses which pass through these stops include the 01, 24, 25, 26, 27, L8 and X30. The 24, 25, 26 and 27 buses run within the local area. The L8 runs North to Cranbourne, the 01 runs further North to Windsor, and the X30 runs South to Frimley.

The Proposed Development has road access to the A322 to the West. This connect the M3 to the M4, with access then available to the wider national road network.

3.3.2 Parking

As per the Car Parking Management Plan produced by ADL, the parking for the Proposed Development will consist of 133 number of total car parking spaces.

- 122 for residential, 6 commercial and visitors use
- 2 spaces for Parish Council
- 3 will be allocated for Car Club

3.3.3 Electric Vehicle Charging

In-line with Local Planning Policy requirements, each house with allocated parking will have an allocated EV charging space (52 total). Of the remaining 70 unallocated charging spots, 20% will be provided with active EV charging provision and the remaining with 80% being installed with passive charging provision.

Of the 6 commercial spaces, 1 spaces will contain active EV charging and the remaining 5 will contain passive charging provisions.

3.3.4 Car-Pooling

There is the provision for 3 no. Car Clubs on site, which will reduce the number of personal vehicles on the site, therefore reducing air and noise pollution effects.

3.3.5 Cycle Storage

The cycle parking for the Proposed Development will consist of:

- Houses: A total of 84 spaces for cycle storage will be provided between all houses
- Flats: A total of 123 spaces for cycle storage will be provided between all flats
- Offices: It has been proposed that secure cycle storage will be provided with Block 2 & 5 (10 spaces total)
- Retail: 12 no. spaces between Blocks 1 & 2 (1 long stay space per 250 sqm for staff, and 1 short stay space per 125m^2 for visitors).
- Community: There are 32 cycle spaces available for community use and 4 long stay storage lockers for staff related to community use.

The large provision for cycle parking encourages the use of sustainable active and multimodal transport alternatives and will have a positive impact on the air and noise pollution of the Proposed Development. For further details please read the ADL Addendum Transport Note 2 report.

3.4 Biodiversity

Biodiversity is generally considered to be the variety of life forms within a certain ecosystem. The Proposed Development currently consists of greenspace, including grass and trees.

The Proposed Development will aim to conserve, enhance and maintain existing environmental quality in-line with the Royal Borough of Windsor and Maidenhead Local Plan. This will be achieved by the following:

- Enhancement of existing trees and planting of new trees.
- Retention of existing hedgerow and creation of new hedgerows.
- Retention of existing grassland / re-planting with native wildflower and grassland seed mix; and
- Incorporation of green roofs and green walls.

For more details of the Proposed Development's impact on site biodiversity, see the Preliminary Ecological Appraisal Report for the scheme.

3.5 Resource efficiency

3.5.1 Construction Phase Waste Management

The Proposed Development will aim to minimise the waste produced from the site during the construction phase.

A comprehensive Construction Environmental Management Plan (CEMP) will be implemented from the outset of site works and will follow the principles of the waste hierarchy. Targets have been set in relation to volume of construction waste and diversion from landfill.

The construction waste generated as part of the development will be segregated and monitored as per best practice, with suitable materials being recycled as part of this process, either to be reused on site or introduced back into the supply chain through recycling by a Licensed Contractor, therefore minimising the amount of waste being disposed of in landfill sites.

Reusing materials on site will reduce the embodied energy of the development through the reuse of the energy that exists in that material. Transportation of new material to the site will be reduced, reducing the CO_2e emissions associated with transportation and material manufacture.

Where waste will need to be disposed of, this will be done in-line with the Waste Hierarchy, as shown in Figure 6, with as much as practicable being recycled, and the remainder being dealt with through a specialist waste recycling contractor. Nominal construction waste should be sent to landfill or for incineration unless this is unavoidable.

Appropriate targets and benchmarks will be set in-line with best practice requirements.

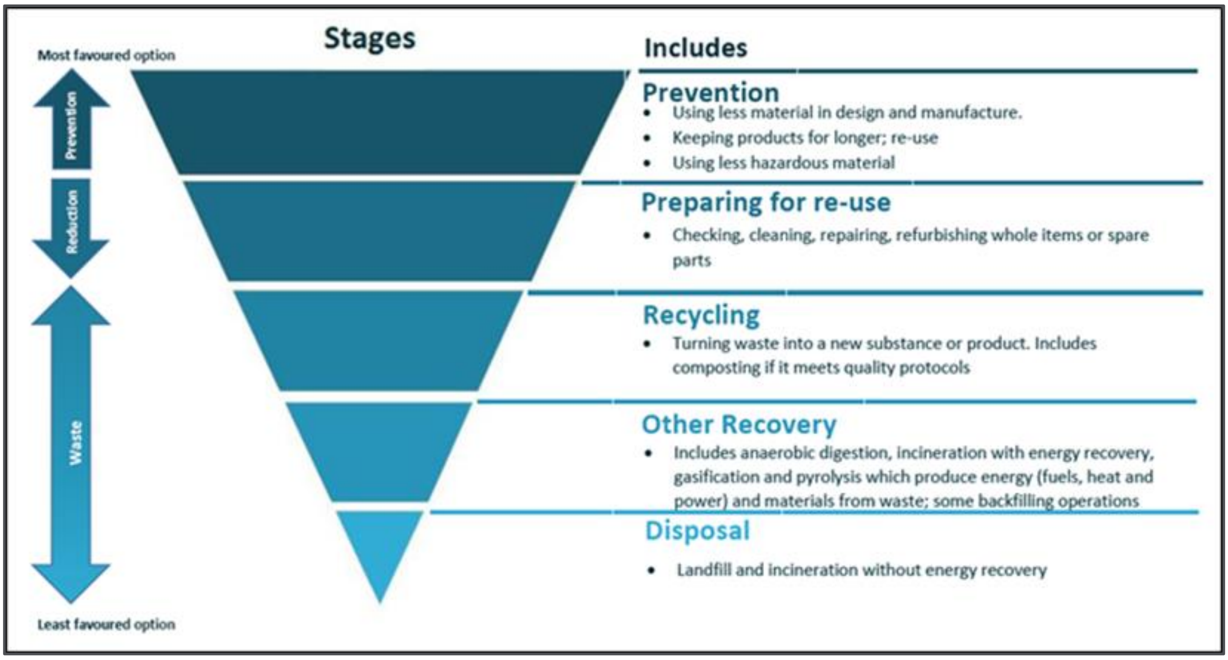


Figure 6 - The waste hierarchy

3.5.2 Resource Management

Policies will be put in place for management of site impacts such as air and water pollution in-line with industry best practice. Monitoring and reporting on carbon emissions and water use from site related activities will take place in-line with national benchmarks.

The overall management of the construction waste will be monitored through the Considerate Constructors Scheme as part of Best Practice Site Management.

3.5.3 Materials

The Proposed Development is to use high quality, low impact materials in order to minimise the overall impact on the environment as far as possible.

The form of construction is anticipated to be of traditional load bearing masonry construction.

All timber and timber-based products used on-site will be legally sourced from a reputable forest certification scheme, such as Forest Stewardship Council (FSC) with appropriate Chain of Custody certification to confirm this. All other materials sourced from suppliers who have an accredited Environmental Management System (EMS) certified through ISO 14001 or the Eco-Management and Audit Scheme (EMAS) ensuring that any environmental impacts caused are managed and reduced. BES 6001 certification should also be considered to ensure products have been made with constituent materials that have been responsibly sourced.

As standard industry best-practice, all insulation on the site will have an Ozone Depletion Potential (ODP) of zero, and a Global Warming Potential (GWP) of <5, further minimising the Proposed Development's effect on global Climate Change.

3.5.4 Water

Areas of the southeast of England have been declared areas of 'serious water stress'. Water is a vital resource and efficient usage should be encouraged in all new buildings. The Proposed Development aims to significantly reduce mains water use through a combination of efficiency measures, including the use of fittings with a low capacity or flow restrictors to reduce water use and PIR sensors linked to water shut-offs valves to reduce the chances of water waste.

Internal water use will be reduced in-line with the Royal Borough of Windsor and Maidenhead Interim Position Statement on Sustainability and Energy Efficient Design, which states that the mains water consumption of residential development meets a maximum target of 105 litres or less per head per day (excluding an allowance of 5 litres or less per head per day for external water consumption). The residential units of the Proposed Development will meet these requirements and the commercial units will reduce mains water use in-line with best practice. The specification below gives an example specification which meets these requirements:

- WCs: 4/2.6 litre effective flush volume
- If 1 urinal only: 2.00 litres/bowl/hour
- If 2 or more urinals at the site: 1.50 litres/bowl/hour
- Hand wash basin taps: 4.50 litres/min
- Kitchen taps: 5.00 litres/min
- Showers: 6.00 litres/min
- Baths: 140 litres
- Domestic sized dishwashers (if installed) 12.00 litres/cycle
- Domestic sized washing machines (if installed) 40.00 litres/use
- Commercial sized dishwashers (if installed) 5.00 litres/rack
- Commercial sized washing machines (if installed) 7.50 litres/kg dry load

3.6 Sustainability Conclusions

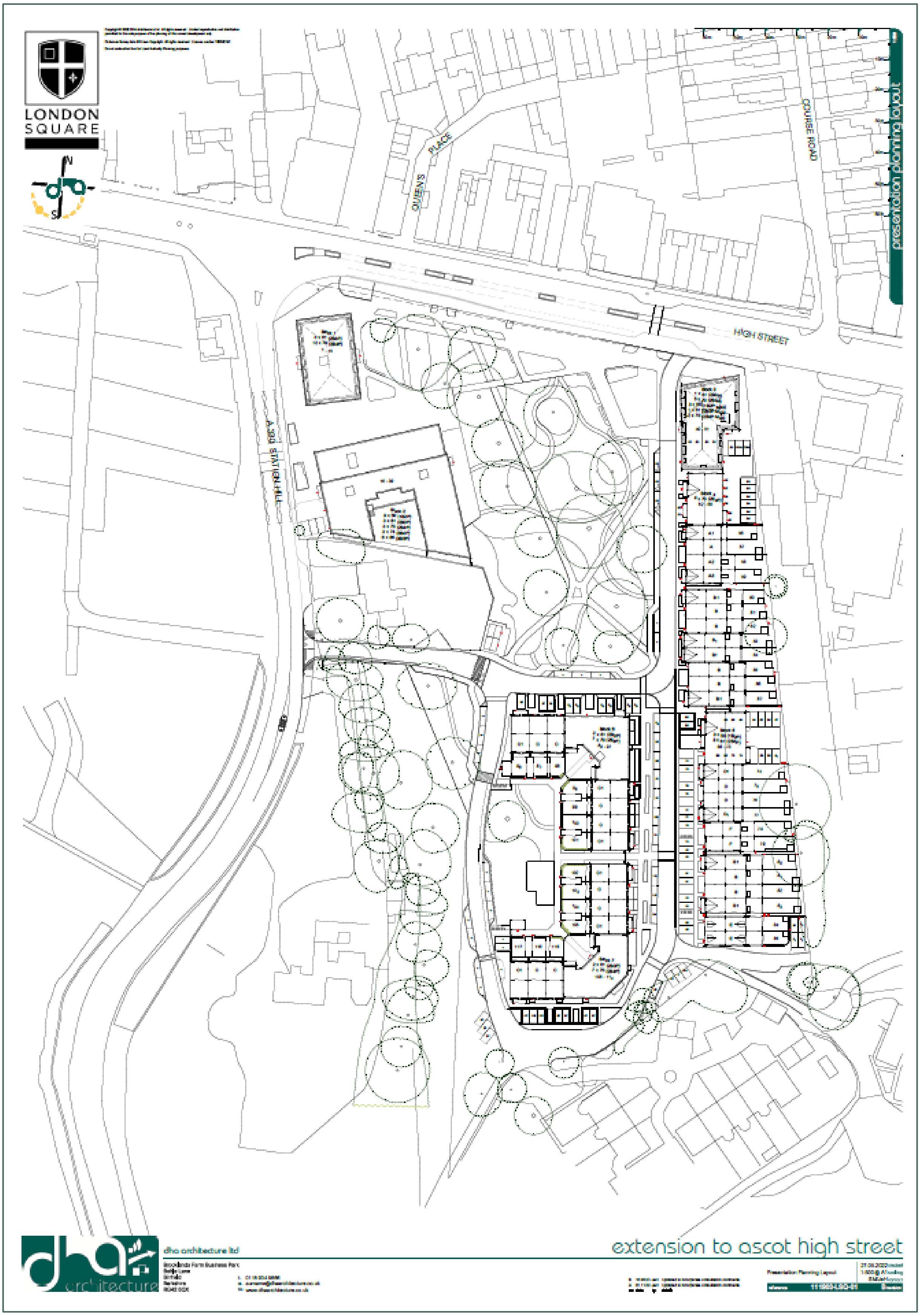
Through a considered approach to sustainability, the Proposed Development is aiming to deliver a highly sustainable mixed-use development which is within an appropriate area for this use and at an appropriate scale. The Proposed Development will make maximum use of the Application Site, providing a mixture of individual houses, flats and commercial space, in-line with the Adopted Royal Borough of Windsor and Maidenhead Local Plan requirements.

The adoption of a sustainable approach to the design and construction has allowed the Proposed Development to provide:

- Development which is suitable for the site with access to public transport and services
- Low internal water use
- Low impact development with minimal noise, light and air pollution
- Consideration of biodiversity on the site within the landscaping design
- Comprehensive site waste management during construction and operation.

Appendices

Appendix A – Site Plan



Appendix B – SBEM Summary Sheet

Building Regulations 2021 - Level 5

Ascot High Street

Building Type	Address	Block & Unit No.	As-Designed/ As-Built Drawings	Air Permeability	Asset Rating (A-G) (0-150)	PV Size (m2)	Notional TER	Lean BER	Green BER	BER/TER Improvement
A1A2: Retail or Office (Retail)	Ascot High Street, SL5 7JE	B1, Unit A	As Designed (Shell & Core)	5	TBC	34.2	1.08	10.15	0.42	61.11%
		B2, Offices			TBC	219	3.22	4.53	-1.09	133.85%

Construction Element	U-Value		
External Wall	0.14	TBC	
Flat Roof	0.13	TBC	
Ground Floor	0.13	TBC	

Construction Element	U-Value	G Value	Frame Factor	Description (manufacturer, make and model)
Windows and Glazed Door	1.00	0.40	10%	Double Glazed Door, whole element U-value

Construction Notes	Description (manufacturer, make and model)
Construction Details	Standard
Air-permeability	5 m3/hr/m2

Heating and Cooling	System Details	Emitter	Controls
Heating & Cooling System	ASHP - (SCOP 5.4, SEER 6.5, EER 4.5) in Retail & Offices & Reception (Model and specifications TBC)	Ceiling Cassettes/Wall Mounted Units	Central Time Control and Local Temperature Control, Weather Compensator
Heating System	Electric heaters in Corridors (SCOP: 1)	Panel Heater	Central Time Control and Local Temperature Control

Hot Water	Description	Secondary Circulation	Circulation Losses (W/m)	Pump Power (kW)	Loop Length (m)	Storage Tank (l)	Storage Losses (kWh/l.day)
Hot Water System	Instantaneous electric hot water	N	n/a	n/a	n/a	120	0.0047

Ventilation	System Details	SFP (W/l/s)	Leakage tested ductwork CEN Classification	AHU CEN leakage standards class	Heat Recovery	Heat Recovery Efficiency (%)	Heat Recovery Type	Variable HR
Mechanical Ventilation (Supply & Extract)	MVHR in Retail & Offices (Model and specifications TBC)	1.10	n/a	n/a	Y	75%	Plate heat exchanger	n/a

Electrical Flow Control		Description
Power Correction Factor	N	<0.90
Separate Metering	N	n/a

Renewables	Description
PV	Retail Unit A - Monocrystalline Silicon, 34.2m2 Area, 180 degrees Azimuth, 15 degrees inclination (located on flat roof) Offices Block 2 - Monocrystalline Silicon, 219m2 Area, 180 degrees Azimuth, 15 degrees inclination (located on flat roof)
Solar Water Heating	N
Wind Turbine	N

Lighting	Description	
Lighting	All spaces provided with LEDs at 150 lm/W, Display lighting at 150Lm/W	LOR=1
Lighting Controls	Office/Corridors - Occupancy and daylight sensors (dimming, different sensor to control back half in offices) Stairwell - Occupancy sensors	
Parasitic power	n/a	

Sign Off of details	Name	Sophie Hopwood	Date	25.01.2023	By signing this document, I declare that the aforementioned details are all correct as per the final "as design" specifications	Name		Date	
						Sign			

Appendix C – SAP Summary Sheet

BRegs L V1 2021

High Street, Ascot

Option	External Wall	Party Wall	Heat Loss Floor	External Roof	Window/ Rooflight	External Doors	Primary Heating	Delayed Start Thermostat	Weather / load Compensator	FGHR	Renewables (PV)	Air Permeability	Mechanical Ventilation	DER vs TER improvement	DFEE vs TFEE improvement	DPER vs TPER improvement
Type	U Value	U Value	U Value	U Value	U Value	U Value	Make	Y/N	Y/N	Y/N	(kWp)		Type	%	%	%
Site-wide	0.18	0.00	0.13	0.11	0.8 - 1.2	1.00	Communal Air Source Heat Pumps for flats Individual ASHP for Houses	N/A	N/A	N/A	90.05kWp	3.00	MVHR	69.95	2.78	40.35

Element	U Values	Description
External Wall - Houses & Flat Wall Type 1	**0.18**	102mm Brickwall, 50mm Unventilated airlayer, breather membrane, Kingspan K108 + Vertical Twist steel wall ties, 25mm Timber studs + Air layer, Plasterboard
Party Wall Wall Type 3	**0.00**	Fulfilled cavity wall with plasterboard either side.
Heat Loss Floor Floor Type 1	**0.13**	65mm screed, 125mm Xtratherm Thin-R insulation (0.022), 150mm concrete beam and block.
External Roof Roof Type 1	**0.11**	200mm Mineral Wool, 150mm Mineral Wool + Timber battens, plasterboard
Window	**0.80**	Triple glazed low E and argon filled windows with whole window U-value of 0.8, G-value of 0.40
Rooflight	**1.20**	Double glazed low E and argon filled windows with whole window U-value of 1.2, G-value of 0.40
External Door	**1.00**	Solid doors with whole door U-value of 1.00.
Primary Heating	-	Individual Air Source Heat Pumps for houses (Dalkin Altherma EBLA04EV3 units or equivalent), communal Air Source Heat Pump system for flats, COP 3.19.
Heat Emitters	-	Radiators.
Controls	-	Time and Temperature Zone Control (Houses), Programmer and at least two Room Thermostats
FGHR	**N**	-
HW Cylinder	**Y**	Megaflo eco indirect unvented cylinders modelled, 210i model specified for the houses and 170i model specified for flats, with a standing heat loss of 1.42 and 1.20kWh/day respectively.
Secondary Heating	**N**	-
Air- Permeability		5.00 - Blower door
Mechanical Ventilation	**Y**	Mechanical Ventilation with Heat Recovery (MVHR) for each unit. Vectaire WHHR-Maxi Plus BY units modelled for SAP.
Renewables	**Y**	90.05 kWp for the residential element, 345W panels
Overheating	**N**	-
Lighting	-	80lm/W Efficacy
Construction Details	-	All PSI values have been assumed to match notional SAP values

Sign Off of details	Name	(PP) M Maclean	Date	23.06.2023	On behalf of the contractor/client:	Name	
	Sign	(on behalf of SRE)				Sign	

Appendix D – Unfeasible Low and Zero Carbon Technologies

Biomass Boiler

Biomass boilers generate heat from the burning of renewable or ‘waste’ fuels. They require a regular feed of fuel and regular heat demand to operate efficiently. A flue taller than the surrounding buildings must be incorporated into the design to minimise air pollution impacts at ground level from particulate emissions.

The use of a biomass boiler system to supply space heating and DHW has been deemed unsuitable due to the high level of particulates emitted from their use. The use of such a system would negatively impact the air quality of the surrounding area and furthermore, could impact the usability of the roof terrace amenity.

Wind Power

Wind power is a developed and productive method of renewable energy generation, however the main limiting factor to its implementation is opposition at a local public and local government level.

To generate a meaningful amount of electricity, large-scale turbines are required which have noise and the visual impacts for the local area. The use of wind turbines has therefore been deemed unsuitable.

Solar Water Heating

Solar Water Heating (SWH) can be used to offset a proportion of the domestic hot water demand (DHW) within a building.

However, due to the low DHW demand at the Proposed Development it is likely to provide minimal CO_2e emissions reductions, while takin up roof-space, better utilised for photovoltaics.

Ground Source Heat Pump

As with ASHP, ground source heat pump (GSHP) systems consume electricity in order to operate.

Beyond 1m below ground level, an average temperature of 15^oC is maintained throughout the year. Because of the ground’s high thermal mass, it stores heat from the sun during the summer. GSHP can transfer this heat from the ground into a building to provide space heating by a similar process to an air source system.

It is recommended that the ground conditions of the site be assessed in detail (through consultation with a GSHP manufacturer and/or purchase of a Ground Conditions report from the British Geological Survey) before a system is installed – the primary heat source that GSHP relies on is solar derived, and shading can affect the ‘re-charge’ of the ground within which the ground loop is laid. This can affect year-on-year CoPs, steadily increasing running costs and reducing CO_2e offset.

Although GSHP can provide a greater efficiency performance than ASHP, it comes at a significantly higher capital cost, due to the extensive groundworks needed to install either ‘slinky’ ground loops or 50-100m deep boreholes.

Because of the significantly higher capital costs of installing a GSHP system, it is not considered to be financially viable for the scheme. Alternative additional technologies will be considered for inclusion within the energy strategy at the site.

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