Barnsley West

Barnsley

Energy & Sustainability Statement

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12/10/2023

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Contents

Executive Summary

This statement has been prepared to address the planning policies CC1 – 'Climate Change', CC2 – Sustainable Design and Construction' and RE1 – 'Low Carbon and Renewable Energy' of the Barnsley Local Plan 2019.

As states, all developments will consistently prioritise an overall reduction in energy demand as the most effective way in which to minimise environmental impacts associated with energy use.

Incorporating the use of highly energy efficient technologies, in addition to low carbon / renewable technologies, and considering the fabric first approach by improvement to the fabric envelopes to the developments, it can be demonstrated that the planning polices will be adhered to throughout the construction phases of the overall development.

The proposed development will seek to follow the energy hierarchy throughout to reduce carbon emissions and energy demand.

The appropriate ecological, flood risk and transport plans have been put in place to ensure the wider impact of the development is lessened and improved where applicable.

The appropriate phases of the development will adhere to BREEAM Excellent requirements unless demonstrated to not be feasible. A pre-assessment will be undertaken at the appropriate times. This is above the minimum requirement of Very Good.

In addition, to satisfy the SPD, a Whole Life Carbon Assessment will be undertaken for all future phases to fully understand the embodied carbon of the development as well as it's predicted operation energy consumption allowing for improvements to be made.

The appropriate version of Building Regulations will be adhered to throughout the development construction phase should there be revisions incorporated to the Building Regulations throughout this time period.

All renewable and low carbon technology deemed feasible within this report will be reviewed accordingly as the appropriate detailed design stage.

In summary, this statement demonstrates compliance with Building regulations, all appropriate planning polies, BREEAM requirements, and SPD requirements.

Please note that the specifications noted within this Energy Statement may change through the detailed design process, however the ethos and standards will remain compliant.

Introduction

Introduction

FHP has been appointed to produce an Energy & Sustainability Statement for the proposed development known as Barnsley West, Barnsley, which comprises of a mixed-use development providing 1,560 new homes, 34 hectares of employment development land for use classes E, B2 and B8. In addition, the proposals will provide:

i) A link road between the M1, Junction 37 and the A635, Barugh Green Road (The section from Higham Common Road to Barugh Green Road)
ii) A new primary school
iii) Small local shops and community facilities
iv) Strategic areas of greenspace and wildlife corridors.

The purpose of the statement is to address the appropriate planning policies from Barnsley Metropolitan Borough Council, CC1 – 'Climate Change', CC2 – 'Sustainable Design and Construction' and RE1 – 'Low Carbon and Renewable Energy' taken from 'Barnsley Local Plan 2019' and to take account the newly adopted Sustainable Construction and Climate Change Adaptation SPD, (known hereon in as the SBD)

The statement highlights the minimum standards the development will achieve across the masterplan and what potential strategies could be utilised to meet current Building Regulations, future Building Regulations given the construction plan period, and the low carbon / renewable technology that could feasibly be included.

As part of the Energy & Sustainability Statement, emphasis will be placed on the Energy Hierarchy which forms the guiding principles for achieving sustainable and low carbon developments throughout the country.

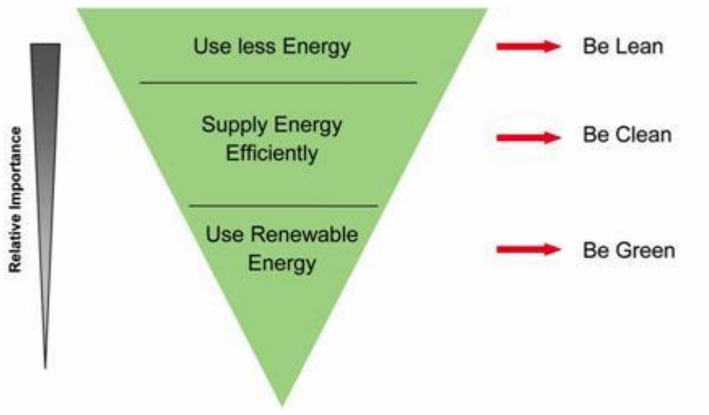


Figure 2 – Energy Hierarchy

In addition, the SBD requires a whole life carbon assessment to be carried out for the development at the appropriate stages. As opposed to the Planning Policies, this assessment looks at the embodied carbon contained within the buildings from manufacture of the construction materials for the lifespan of the buildings. In addition, this assessment investigates a developments operational energy consumption.

Objectives

The objectives of this Energy & Sustainability Statement are as follows:

- Demonstrate how the proposed development would minimise resource and energy consumption.
- Demonstrates compliance with Planning Policies CC1, CC2, RE1 and the SPD.
- Outline the applicant commitments in terms of operational CO_2 Emissions and reductions.

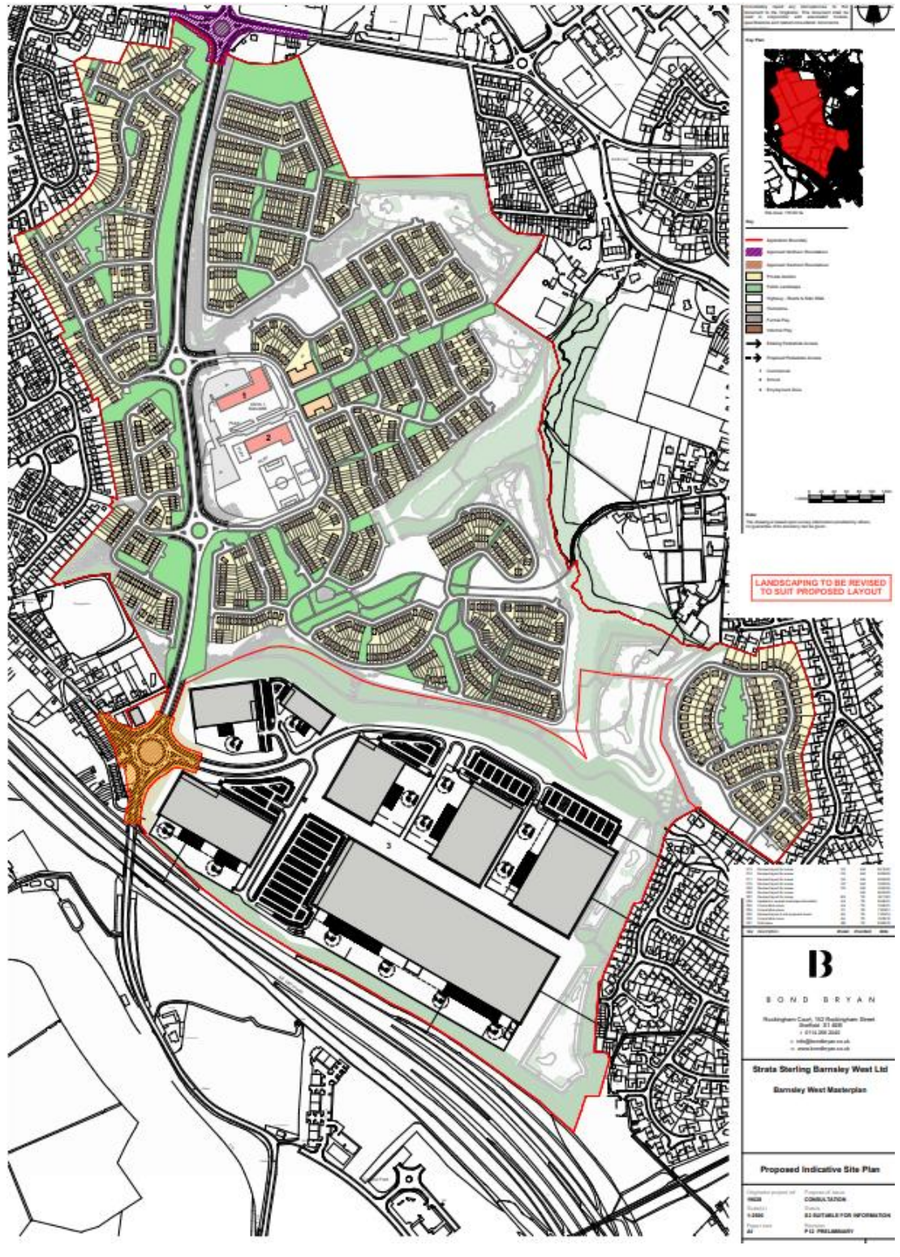


Figure 3 - Site Plan

Development / Application Description

Proposed Development

The proposed development comprises of two planning applications, which are outlined below:

Planning Application Ref: 2021/1090

Hybrid planning application for residential development up to 1,560, including;

(a) Full planning permission for:

- earthworks to create development platforms;
- strategic drainage ponds / dry detention basins and associated drainage infrastructure;
- construction of a new link road;
- location of strategic landscaping and ecological areas;
- demolition of existing buildings;
- works to Hermit Lane and;
- erection of Phase 1(a) residential development comprising 216 dwellings.

(b) Outline planning permission for:

- residential development comprising up to 1,344 dwellings;
- new primary school;
- small shops and community facilities and;
- associated infrastructure works.

Planning Application Red: 2021/1089

Hybrid planning application for employment development, including:

(a) Detailed planning permission for:

- earthworks to create development platforms;
- drainage features, including dry detention basin, embankments, bunds;
- strategic landscaping, ecological areas and;
- access

(b) Outline planning permission for:

- Employment (Use Classes E, B2 and B8 with ancillary office) and;
- Associated servicing and infrastructure works including car parking, vehicle, pedestrian and cycle circulation, plot landscaping, noise mitigation, drainage features and all associated infrastructure.

Policies and Drivers

There can be several motives that drive an Energy & Sustainability Statement in a certain direction, this is derived from different policies and requirements based on where the development is located and which local authority the development falls under. Many of these policies can have significant impacts upon the way in which the design is conceived.

In this instance and as discussed in the introduction, the planning policies for this development are from Barnsley Metropolitan Borough Council's Local Plan adopted 2019, in addition the Supplementary Planning Documents. Along side these policies run the appropriate aspects of Building Regulations current at the time of construction.

Current Policy Framework

The policies considered when preparing the development sustainability statement are described below. They have a particular focus upon energy and carbon reduction extracted from various policies from international to local level, that aim to reduce greenhouse gas emissions, particularly carbon dioxide (CO_2), and hence contribute to sustainable development.

The specific policies and drivers' documents that are applicable to the proposed development include:

- Building Regulations Part L1 & L2 (2021 Version current at the time of writing)
- National Planning Policy Framework (NPPF)
- Barnsley Local Plan 2019 – Sustainable Construction and Climate Change Adaptation Supplementary Planning Document
- Barnsley Local Plan 2019 Policy CC1 – 'Climate Change'
- Barnsley Local Plan 2019 Policy CC2 – 'Sustainable Design and Construction'
- Barnsley Local Plan 2019 Policy RE1 – 'Low Carbon and Renewable Energy'
- Barnsley Declared Climate Emergency

Building Regulations Part L2 (2021)

A revised version of Part L was launched on June 15th 2022, as such this development must adhere to the new version of Part L 2021.

Figure 4 – Part L2 2021

Part L2 is split into 5 criteria that must be met to achieve compliance. These are as follows:

- Criterion 1 – The Building Emission Rate (BER).
- Criterion 2 – Limits on design flexibility.
- Criterion 3 – Limiting solar gains in summer.
- Criterion 4 – Building performance consistent with the BER.
- Criterion 5 – Provision for energy efficient operation of the building.

Criterion 4 & 5 are specifically considered during the construction and the post construction stage of the development.

Part L is also split into Part L Volume 1 and Part L Volume 2. Volume 1 specifically references domestic residential buildings and volume 2 references non-domestic as such have different requirements however the principals are the same.

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (February 2019) sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

At the heart of the National Planning Policy Framework is a 'presumption in favour of sustainable development', which requires Local Plans to meet development needs, unless any adverse impacts would significantly and demonstrably outweigh the benefits. National Guidance says that:

i) The purpose of the planning system is to contribute towards achieving sustainable development.

ii) Sustainable development comprises of economic, social and environmental dimensions, which leads the planning system to perform the following three roles:
- Economic – contributing to building a strong, responsive and competitive economy.
- Social – supporting strong, vibrant and healthy communities.
- Environmental – contributing to protecting and enhancing the natural, built and historic environment.

iii) These roles are mutually dependant therefore to achieve sustainable development economic, social and environmental gains should be sought jointly through the planning system. Planning should also actively guide development to sustainable solutions.

iv) In order to achieve sustainable development, improvements in the quality of the built, natural and historic environment, as well as in people's quality of life must be pursued, including(but not limited to): improving the ease of job creation, moving from a net loss of bio diversity to a net gain for nature, replacing poor design with better design, improving working, living, travelling and leisure conditions for people and widening the choice of high quality homes.

v) Plans and decisions must take into account local circumstances to ensure sustainable development is responded to appropriately in different areas.

vi) At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-making and decision-taking. For plan-making this means that:
- Local Planning Authorities should positively seek opportunities to meet the development needs of their area; and
- Local Plans should meet objectively assessed needs, with sufficient flexibility to adapt to rapid change, unless: any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this framework taken as a whole; or specific policies in this framework indicate development should be restricted.

Planning policies should follow the presumption in favour of sustainable development approach so development which is sustainable can be approved without delay. All Local Plans should set clear policies that will guide how the presumption should be applied locally.

Planning Policies

The planning policies appropriate to this development are taken from the Barnsley Local Plan adopted January 2019.

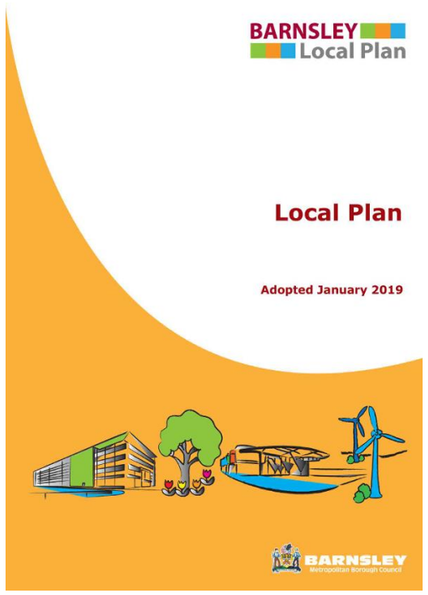


Figure 5 – Barnsley Local Plan 2019

Planning Policy CC1 – 'Climate Change'

This planning policy taken from the Barnsley Local Plan Adopted 2019 states the following:

Policy CC1 Climate Change

We will seek to reduce the causes of and adapt to the future impacts of climate change by:

Giving preference to development of previously developed land in sustainable locations;

Promoting the reduction of greenhouse gas emissions through sustainable design and construction techniques;

Locating and designing development to reduce the risk of flooding;

Promoting the use of Sustainable Drainage Systems (SuDS);

Promoting and supporting the delivery of renewable and low carbon energy; and

Promoting investment in Green Infrastructure to promote and encourage biodiversity gain.

Figure 6 – Planning Policy CC1 – Climate Change

Planning Policy CC2 – 'Sustainable Design and Construction'

This planning policy taken from the Barnsley Local Plan Adopted 2019 states the following:

> **Policy CC2 Sustainable Design and Construction**
>
> Development will be expected to minimise resource and energy consumption through the inclusion of sustainable design and construction features, where this is technically feasible and viable.
>
> All non-residential development will be expected, to achieve a minimum standard of BREEAM 'Very Good' (or any future national equivalent). This should be supported by preliminary assessments at planning application stage.

Figure 7 – Planning Policy CC2 – Sustainable Design and Construction

Planning Policy RE1 – 'Low Carbon and Renewable Energy'

This planning policy taken from the Barnsley Local Plan Adopted 2019 states the following:

> **Policy RE1 Low Carbon and Renewable Energy**
>
> All developments will be expected to seek to incorporate initially appropriate design measures, and thereafter decentralised, renewable or low carbon energy sources in order to reduce carbon dioxide emissions and should at least achieve the appropriate carbon compliance targets as defined in the Building Regulations.
>
> We will allow development that produces renewable energy as long as there is no material harm upon:
>
> - The character of the landscape and appearance of the area;
> - Living conditions;
> - Biodiversity, Geodiversity and water quality;
> - Heritage assets, their settings and cultural features and areas;
> - Key views of, from or to scenic landmarks or landscape features;
> - Highway safety, or
> - Infrastructure including radar.
>
> In assessing effect, we will consider appropriate mitigation which could reduce harm to an acceptable level.
>
> Proposals will be expected to include information regarding their efficiency.
>
> Proposals must be accompanied by information that shows how the local environment will be protected, and that the site will be restored when production ends.

Figure 8 – Planning Policy RE1 – Low Carbon and Renewable Energy

Declared Climate Emergency

In September 2019 Barnsley Metropolitan Borough Council declared a climate emergency, with two programmes to help Barnsley reduce its carbon emissions.

Zero 40

Barnsley Council will become net carbon zero by 2040, or earlier if possible. Zero 40 will focus on improvements in the council's environmental performance. This will be measured by reducing carbon emissions against agreed milestones. The end result will see us being net zero carbon in our work by 2040.

Zero 45

The borough or Barnsley Council will become net zero carbon by 2045. Zero 45 is a programme where the council will help the whole of Barnsley including its residents, communities, partners and businesses to support Barnsley's changeover to be net zero carbon by 2045.

Sustainable Construction and Climate Change Adaptation SPD

This element has been taken from the Supplementary Planning Document – Sustainable Construction and Climate Change Adaptation Adopted July 2023.

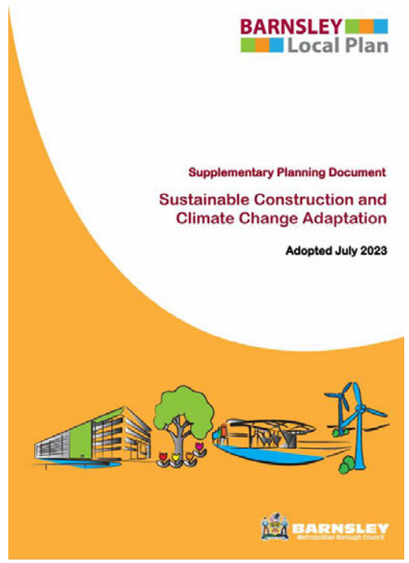


Figure 9 – Sustainable Construction and Climate Change Adaptation SPD

The document states the following:

A whole life cycle assessment will be required with full or hybrid applications or assessment of approval of reserved matters for major developments (10 dwellings or above and 1000m^2 or above for commercial developments or change of use developments). Where we receive an outline application, if minded to approve, a condition will be added requiring submission of a Whole life carbon assessment alongside reserved matters. The whole life carbon assessment will be expected to follow the model set out in the RICS professional statement 'Whole Life Carbon Assessment for the Built Environment, 2017', or, if applicable, the latest subsequent version of this document or other recognised document setting out best practice for whole life carbon assessment, which RICS members must act in accordance with.

Energy & Sustainability Statement

All developments within the applications will prioritize an overall reduction in energy as the most effective way in which to minimise environmental impacts associated with energy use. The use of energy efficient technologies, in addition to low carbon and renewable technologies to supply the remaining energy shall result in lower greenhouse gas emissions as compared with the use of conventional alternatives.

As discussed previously the developments will utilise the energy hierarchy to achieve a sustainable development and reduction in carbon emissions. This is by utilising a fabric first approach, with review of the energy supplying the development and then a full review of the feasibility of the types of Low Carbon / Renewable technology that could potentially be utilised throughout the development.

Figure 10 – Energy Hierarchy

Be Lean – Use Less Energy

In order to promote sustainable design, the fabric first approach will be adopted. This is to reduce heat loss through fabric elements to reduce the overall requirement for energy in the first instance. This utilises the following methodology:

- Maximise the use of natural daylight.
- Solar shading to reduce overheating.
- Improve building fabric.

Building Regulations Part L2 2021, (current at the time of writing) have a set of minimum fabric U values that must be adhered to and may not be exceeded. This is to say that these are the minimums the development will work towards and it is reasonable to suggest the further future iterations of the Building Regulations will have improved upon these said limiting values

Table 1: Fabric Performance

Element	Limiting U value (W/m²/k) For Non-Domestic	Limiting U value (W/m²/k) For Domestic
External Walls	0.26	0.26
Floor to Extension	0.18	0.18
Roof	0.18	0.16
Windows	1.60	1.60 / 0.35 g-value
Rooflight	2.20	2.20 / 0.55 g-value
Pedestrian Doors	1.60	1.60
Vehicle Doors	1.30	N/A

Passive Measures

Passive design measures are those which reduce the energy demand within buildings.

These are the most effective and robust measures for reducing CO2 emissions as the performance of the solutions (e.g. wall insulation), is unlikely to deteriorate significantly with time or be subject to change by future property owners. In this sense, we can be confident that the benefits of these measures will continue at a similar level for the duration of their installation.

The Development has taken a 'fabric first' approach to reducing energy demand and CO2 emissions. Initial targets have been set for the design team to achieve, with detailed confirmation of the fabric performance requirements being calculated at the relevant stage in the design.

The design of the fabric will be reviewed throughout the developments design lifespan and adhere to the appropriate Building Regulations Part L that is current at the time of the pashed detailed planning submissions.

<u>Improving Glazing</u>

It is likely to achieve compliance with the minimum requirements of Building Regulations, the glazing U -values will likely be required to be better than he currently set limiting U values. Improvements to glazing not only reduce heat loss, they also minimise solar gains which aid with the risk of overheating within buildings.

Typically the glazing will look to be double glazing as a minimum to all elements of the development.

<u>Thermal Insulation</u>

Adequate thermal insulation of a building's façade is not only crucial to reducing energy demand but key to securing occupant thermal comfort. The developments energy demand can be significantly reduced through the provision of an efficient thermal envelope, by reducing the thermal transmittance of the building envelope where appropriate and reduce heating requirements.

Improving the U-value of the fabric envelope will aid with the reduction in CO_2 emissions and will aid in the reduction of overall greenhouse gasses by utilising the use of sustainable design and construction techniques.

<u>Air Permeability</u>

Air permeability plays a huge part in sustainable design and construction, as this is one of the largest contributors to heat loss within developments. It will therefore be focussed upon when designing and choosing he construction methods for the development. This also require a high level of build quality and quality control ensuring this is maintained throughout the construction phase.

Active Measures

The energy demand of the development will be further reduced by the incorporation of active energy efficiency measures in the design of the mechanical and electrical engineering systems. The following energy efficiency measures have been considered for use on the development:

<u>Lighting</u>

The development will be provided with energy efficient lighting through the use of LED in all rooms. The advent of LED technology in recent years has had significant impacts upon energy demand and CO_2 reduction.

The development will at the appropriate points throughout the design and construction process of the overall development site, periodically review current technologies and incorporate new lighting advancements subject to their benefits and feasibility.

<u>Ventilation</u>

Ventilation is important to maintain good indoor air quality by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation or mould growth.

Ventilation can also be used to reduce the amount of heat loss from a building by utilising an efficient heat recovery system. It can also aid thermal comfort in summer months by removing warm air from the space.

It is assumed that where applicable the feasibility of Heat recovery ventilation systems will be reviewed for the non-domestic aspects of the developments.

Heat recovery within the units will likely be at 80% heat recover efficiency and will have low specific fan powers (SFP's).

For the most part and subject to the current Building Regulation requirements, it is foreseen that the domestic dwellings will utilise a natural ventilation system apart from extract ventilation within wet areas. In these areas the ventilation will have low specific fan powers (SFP's) for the intermittent fans.

Domestic Hot water

Significant savings can be made with regards to greenhouse gas emissions through the domestic hot water services (DHW) and how the heat for these services is generated. It is envisaged that the domestic properties will utilise a domestic combination gas boiler which will provide the domestic hot water requirements.

Typically, a centralised system or an electric point of use system would be investigated for the non-domestic buildings. Again, subject to the requirements of the Building Regulations of the time.

Heating

Heating is one of the most energy intensive requirements for any development, as such the more efficient the heat generation can be at this stage, the more effective and significant the energy consumption reductions and greenhouse gas emission reductions will be.

For the domestic aspects, it is proposed an highly efficient gas combination boiler will be utilised, however this is subject to the Building Regulations that are applicable at the time.

In terms of the non-domestic developments, this can be done in a combination of methods, all of which are to be confirmed depending on the Building Regulations requirements. However, as it is proposed that the carbon emission reduction should be seen as the golden thread, which is the ethos of Barnsley Council, it is reasonable that the most efficient low carbon route will be taken.

Cooling

Cooling is likely only applicable to the employment aspect of the development and will typically be provided by the use of highly energy efficient heat pumps that will likely provide the heating as well to these types of developments. However the appropriate technology will be reviewed inline with the appropriate requirements of the Building Regulations which are current at the time of submission.

Phase 1 Domestic Properties Summary

For the erection of Phase 1a residential development consisting of 216 dwellings, the following demand reduction measures are expected to be proposed to reduce initial energy consumption:

i) Building envelope U values significantly better than limiting Building Regulations values.
ii) Double Glazed windows
iii) Composite front and rear doors
iv) Reduction in air permeability

The following energy efficiency measures are expected to be incorporated to efficient use of energy:

i) High efficiency combination gas boiler providing heating and domestic hot water.
ii) Low energy lighting.
iii) Low specific fan power (SFP) and intermittent fans.

It is a requirement that all the dwellings must achieve the Target Emission Rate (TER). It is also expected that they will achieve a reduction in Dwelling Fabric Energy Efficiency Rates (DFEE) over the Target Fabric Energy Efficiency Rate (TFEE)

In addition for phase 1a residential development Electric Vehicle Charging Points will be included for each dwelling.

Following the review of feasible renewable technologies further in this report, it will be determined if this phase requires any additional low carbon / renewable technology to mee the Building Regulation Requirements.

Future Phase Domestic and Non-Domestic Properties Summary

For future phases, the proposed design and servicing solutions will be dependant upon the Building Regulations applicable at the time, and the expected push towards decarbonization of the electricity network.

For the erection of future phases of residential and on-domestic properties, the following demand reduction measures are expected to be proposed to reduce initial energy consumption:

i) Improve U-values of the external envelope.
ii) Improve U-value of glazing.
iii) Improve air permeability of the envelope

The following energy efficiency measures are expected to be incorporated to ensure efficient use of energy:

i) Improve efficiency of the space hating and cooling
ii) Use of energy efficient lighting.
iii) Use of intelligent controls
iv) Use of variable speed pumps, fans and drives to match supply and demand.
v) Improve efficiency of heat recovery to mechanical ventilation systems.

Following the review of feasible renewable technologies further in this report, it will be determined if each subsequent phase requires any additional low carbon / renewable technology to mee the Building Regulation Requirements. This will be investigated for the proposed development during the detailed design stages.

The inclusion Electric Vehicle Charging Points will be considered for the future phases of employment development as well as the domestic units.

Be Clean – Use Clean Energy

This section refers to the development utilising 'clean energy', this refers to connecting to a district heating network or having on-site combined heat and power (CHP) generation.

Upon review of the UK Heat Map that references the current District Heating Networks in the UK, it has been determined that there is no network in the area or proposed to be in the area in the near future. However, this may change over the construction period of the development.

Should a district heating network become available during the course of the design and construction period, then it will be investigated within the detailed design if this is feasible for a particular phase of the development. If deemed feasible, the appropriate measures to incorporate this within the designs will be made.

Be Green – Use Low Carbon or Renewable Energy

This section refers to the use of Low Zero Carbon Technology / Renewable technology to further lower the developments CO_2 emissions and energy usage.

A review of Low Zero Carbon and Renewable Technologies has been conducted with the viability of each investigated for this site and the conclusions of which are described in the following sections.

Solar Thermal

Solar thermal panels operate by capturing solar energy and transferring this via glycol to a thermal store to generate hot water. These systems can operate at efficiencies up to ~75% thus a high yield of energy can be derived from small collector areas.

There are two types of collectors, Flat plate which consists of a simple matt black collector with a selective coating to increase efficiency. The second type is Evacuated Tube, this is more complicated to manufacture however can be more efficient than flat plate as heat losses through the system are reduced. However, the cost is higher.

This would be used to pre-heat the domestic hot water for use at sinks and wash basins. Whilst the energy generation is modest, it can be used for pre-heat in the low temperature application. The equipment is generally of a lower capital cost than other LZC technologies.

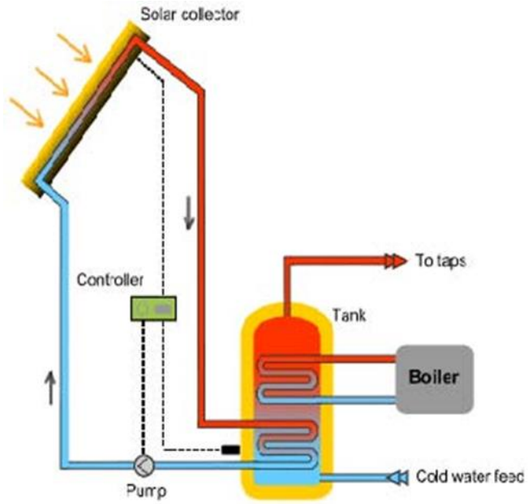


Figure 11 – Solar Thermal Diagram

Given that the building can utilise a low-pitched roof it is ideally suited to the application of solar hot water panels. Assuming the hot water demand for the building is available, this technology could be considered viable.

It is likely that this technology would be technically feasible in particular for the dwellings, given the available roof space. However, Solar thermal offer limited returns in terms of carbon reductions when compared to other technologies for similar costs.
This will however be investigated further at the appropriate stages of design development.

Micro Wind Turbines

Figure 12 – Micro Wind Turbine

For efficient operation and to yield high energy output, wind turbines require a smooth laminar flow of air. The Development is located within a dense urban environment; therefore, the wind flow profile is erratic and consequently, not conducive to high annual yields. Moreover, mounting wind turbines on the roofs of the development could result in unacceptable vibration and resonance being felt within the building. The turbines are also likely to generate noise which may be a nuisance to neighbouring properties. This scenario is likely to result in the turbines being switched off.

It is likely that turbines will be met with restraint by local planning department due to aesthetic and noise issues as described above. They also provide a poor yield in urban settings and therefore would be likely be financially unviable when compared to other technologies such as air source heat pumps and solar photovoltaic options.

This technology is therefore deemed unfeasible.

Biomass Boiler

Figure 13 – Biomass Boiler

Biomass boilers burn wood fuel or other bio-fuel sources to generate heat. These boilers can operate at high efficiencies, comparable to condensing gas boilers. However, they require a large fuel store to maintain continuous operation during the winter months. As such, area take for such plant is high. Furthermore, fuel deliveries in city-centre locations can prove difficult and security of fuel supply is an important consideration. Biomass boilers also result in higher emissions levels of Nitrous Oxide (NOx) in comparison with gas boilers. This can have a negative impact on the local air quality, a key issue throughout any town centre.

It is likely that the use of a biomass boiler could yield significant regulated CO2 emissions savings, however this would also likely result in an increase of NOx emissions from the Development as well as a significant store footprint and the complication of regular fuel deliveries.

This could be considered on a building by building basis, but it is unlikely to be financially viable when other technologies can offer better carbon offsets / reductions for less capital outlay.

In addition this technology is unlikely to align with any future development of the Building Regulations. Therefore this technology is not considered to be feasible.

Combined Heat & Power CHP

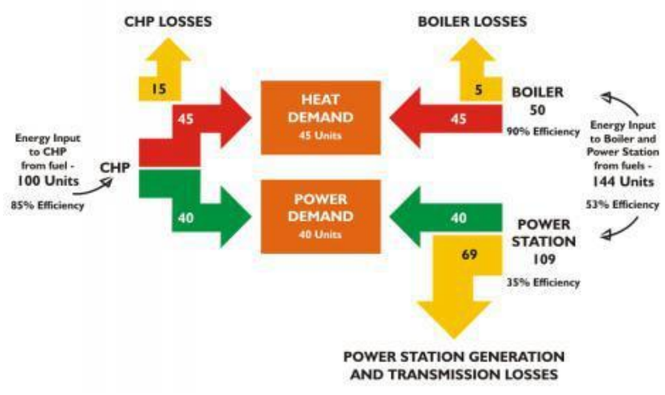


Figure 14 – CHP Process Diagram

Combined heat and power systems use a gas fuelled engine to generate both electricity and heat. CHP, or co-generation as it is also known, is the process of capturing and using the waste heat produced by the generation of electricity.

By generating heat and power simultaneously, CHP can reduce carbon emissions by up to 30% as shown above, compared to the separate means of conventional generation via a boiler and power station.

Greater use of CHP would contribute significantly to protecting the environment by reducing CO_2 emissions. For example, a 100 kWe CHP unit fuelled by standard natural gas provides an annual saving of approx. 206 tonnes of CO_2 over conventional electricity generation of gas-fired boilers. Using a stand-alone CHP depends on requirements both for heat and electricity. The optimum CHP plant capacity for the proposed building needs to be determined by an economic assessment. It is important to have a reasonable match between the generated heat output and power, the optimum ratio of heat demand to power demand generally lies between 1.3:1 and 2:1. There are opportunities for exporting electricity back to the grid depending on excess output, but this is unlikely to be viable on this project. Where standby power generation is required to reduce dependency of public supplies of electricity, it may be particularly advantageous to install a CHP unit, thereby avoiding the additional capital cost of a separate standby generator.

To make CHP viable it normally needs to operate for a minimum of 17 hours a day, 7 days a week, with minimal stopping and starting. If there is not a sufficient base load the CHP will keep tripping out. Excess heat generated by the CHP can be ‘dumped’ by an Intercooler, however if the heat rejection is too high the system becomes financially unviable. CHPs should generally only be sized on hot water generation requirements.

This technology could potentially contribute to the domestic hot water requirements for the non-domestic development where there is significant demand, however this is unlikely. It is also unlikely that this technology will be aligned with any future revisions of the Building Regulations and therefore this technology is deemed unfeasible.

Air Source Heat Pumps

Figure 15 – Air Source Heat Pumps

A heat exchanger extracts the heat from the air. A heat pump raises the temperature of the refrigerant via the compression cycle (also used in refrigerators) to supply heating the building, but in reverse cycle to provide cooling to the internal environment in the summer.

These could be either ceiling mounted cassette units, wall mounted units or floor mounted units. Alternative in this instance, it is proposed that they are used to send hot water around a typical radiator panel system for the workshop area.

In addition, Variable Flow Refrigerant (VRF) units which would provide heating and cooling to office accommodation. In this scenario the outdoor Air Source Heat Pumps send refrigerant to internal cassette units can provide heating and cooling simultaneously in separate spaces. This is a highly efficient technology.

Air Source Heat Pumps use electricity as fuel, however their efficiency in both heating and cooling modes can be over 4 times as efficient as electrical panel heating, meaning for every 1KW of electricity you can achieve 4kW of heating dependant on unit sizes etc.

The outdoor units can be located anywhere and are not dependant on orientation. They need to be externally mounted and in a local compound to be safe.

In addition, this technology could be used to provided heating through a conventional wet heating system for the domestic properties. It is suitable for generating heating and cooling for the future phases of the development and can contribute towards domestic hot water demand.

It is likely to be considered for the domestic properties from 2025 onwards to incorporated into Barnsley's zero 45 target.

They carry lower capital outlay and have a very high efficiency. As such the technology is deemed feasible for future phases and will be investigated at detailed design stages.

<u>Solar Photovoltaic Panels (PV)</u>

Figure 16 – PV Panels

Photovoltaic panels generate electrical energy which can be used to offset the electrical energy used within a building – a significant proportion of the total energy demand for an office building. In order to maximise output photovoltaic panels are best orientated toward the sun when at its greatest intensity. In the UK optimum output of a panel is achieved when orientated due south and angled at 15° from the horizontal, but substantial yields can still be achieved with panels arranged away from this optimum.

The development as a whole incorporating all types of properties has the potential of incorporating PV onto the majority of the roofs. This would have a significant offset in carbon reduction and energy consumption.

This technology is relatively ow cost when compared with other technologies and is deemed as being feasible. Therefore this will be considered at the detailed design stage.

Table 1 – Summary of Low Carbon / Renewable Technology

Technology	Suitable?	Comments
Air Source Heat Pumps	YES	Suitable to generate space heating and cooling for the future phases of the development, and contribute towards the Domestic Hot Water demand building type dependant). Currently expected to be incorporated into the non-domestic elements, but maybe considered for the domestic properties from 2025 onwards. Will be considered further at detailed design.
Ground Source Heat Pumps	NO	Possible and likely to be suitable land area to incorporate, but unlikely to be financially viable when compared to the air source heat pump option.
Combined Heat and Power	NO	Could contribute towards the domestic hot water demand for the non-domestic development where significant year round demand is in place. Unlikely to align with future Building Regulation requirements.
Biomass	NO	Possible, but unlikely to be financially viable when compared to the air source heat pump option. Could be considered on a building by building basis. Unlikely to align with future Building Regulations requirements.
Solar Water Heating	YES	Available roof space likely to be available, however carbon savings would be low compared to other technologies to contribute towards the domestic hot water demand. Will be considered at detailed design.
Photovoltaics	YES	Available roof space likely to be available. Would be a suitable technology to be compatible with air source heat pump integration. Will be considered at detailed design.
Wind Turbines	NO	Poor yield within urban areas and possible panning issues. Unlikely to be financially viable when compared to other technologies such as air source heat pumps and solar photovoltaic option.
Minewater	NO	Geology beneath the proposed development may support the use of minewater or geothermal projects using open loop heat exchangers. However, would require significant further investigation not currently considered a viable option.

It is expected that the incorporation of air source heat pumps and photovoltaics would be the most feasible low zero carbon / renewable technology for the proposed developments. The integration of these technologies an compliance with Building Regulations will e considered at the detailed design stage for each development phase.

The actual carbon reduction that these technologies offer and dependant on building type and will adhere to the Building Regulations current at the appropriate time.

Flood Risk and Sustainable Drainage

The Flood Risk Assessment (FRA) has been undertaken by JPG for the proposed development.

The report confirms that the site is located within Flood Zone 1 and NPPF Technical Guidance states that residential and industrial / commercial uses are considered less vulnerable in terms of flood risk and are appropriate in Flood Zone 1. The FRA has considered all potential sources of flood risk at the site and concluded these to be low for all sources.

The JPG report confirms that on site ground investigation has been carried out and confirms the site is mixed underlying material consisting of rock, cohesive and fill material which would be unsuitable for infiltration drainage methods on this site.

Based on the drainage hierarchy the most appropriate location for discharge of surface water from the development would be into an onsite watercourse and land drainage ditch system. Where levels dictate the surface water infrastructure drainage will be gravity system. However, some areas may need to be pumped due to the levels.

Surface water discharge from the site will be restricted to greenfield run off rate of 3.900 l/s for all storms up to the 1 in 100 year event plus climate change. Attenuation storage will be provided on site in attenuation basins and the pipe network.

Biodiversity

The outline Biodiversity and Ecological Management Plan (BEMP) has been undertaken by Tetra-Tech for the proposed development.

This report details the proposed habitats to be retained and created during Phase 1 and future phases.

Transport and Travel Planning

The development will provide and encourage a range of sustainable transport options including walking, cycling and opportunities for public transport.

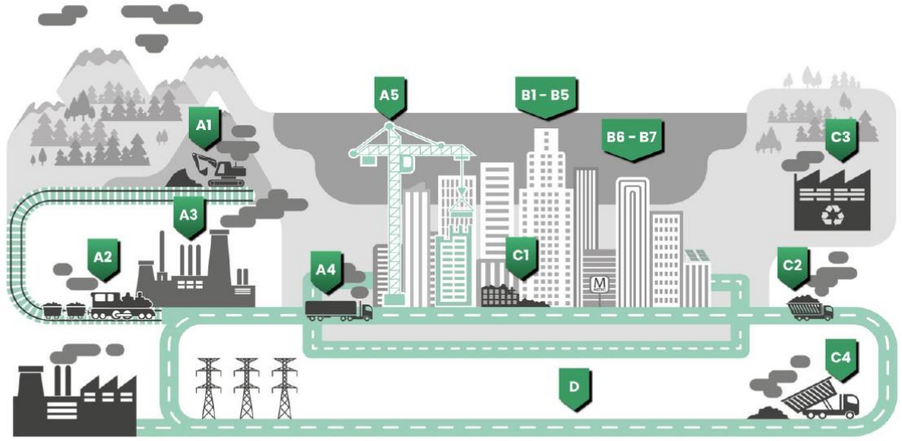
BREEAM

Planning policy CC2 required BREEAM ‘Very Good’ to be met on the development. However, as Phase 1a consists of residential elements only, BREEAM is not appropriate or applicable in this instance.

The future phases that consist of the employment area, school and any community facilities, anything of a non-domestic nature and that fall under the appropriate size requirements as stated within planning policy CC2, will adhere to achieving BREEAM Excellent where practical and feasible. This is to go above and beyond the minimum requirements of the planning policy by incorporating a more onerous standard upon the development.

A BREEAM pre assessment will be undertaken for these appropriate sites which will outline all the target and feasible credits for said phase. This will be undertaken prior to reserved matters applications.

Whole Life Carbon Assessment for the Built Environment



A1 - A3 Product stage
- **A1** Raw material extraction
- **A2** Transport to manufacturing site
- **A3** Manufacturing

A4 - A5 Construction stage
- **A4** Transport to construction site
- **A5** Installation / Assembly

B1 - B5 Use stage
- **B1** Use
- **B2** Maintenance
- **B3** Repair
- **B4** Replacement
- **B5** Refurbishment
- **B6** Operational energy use
- **B7** Operational water use

C1 - C4 End of life stage
- **C1** Deconstruction & demolition
- **C2** Transport
- **C3** Waste processing
- **C4** Disposal

D - Benefits and loads beyond system boundary

Reuse, recovery and/or recycling potentials, expressed as net impacts and benefits

Figure 17 – Whole Life Carbon Assessment

A Whole Life Carbon Assessment that follows the RICS ‘Whole Life Carbon Assessment for the Built Environment’ 1st edition 2017 guidance document consists of in its essence, two distinct aspects. Firstly, it reviews the embodied carbon within a development. This is specifically for the buildings within the development.

Embodied carbon is counted as the carbon emissions that were emitted during the manufacturing of the materials used in the construction process of the development.

This is reviewed over the whole expected lifespan of the building and takes account of any building elements that can / have to be replaced after a certain period of time.

An embodied carbon assessment also reviews the end of life by investigating what happens to the deconstructed materials and any carbon emissions released by the destruction of materials.

The second main aspect reviews the predicted operational energy of the development This review investigates the actual energy consumption anticipated by each building on the development instead of utilising compliance calculations.

This predicted energy consumption takes into account any energy used within a building, including heating cooling, process and small power etc.

These two elements combined give a carbon equivalent figure for the lifespan of a building or development. When conducted at an appropriately early stage, this allows for greater opportunity to review reductions and allow for greater scope for improvements to be made.

As a minimum, a whole life carbon assessment must be carried out before the commencement of the technical design (RIBA Stage 4 or equivalent) of the project.

The purpose for this type of assessment is to take into account the fact that the electrical grid is in the process of decarbonisation. As it heads towards net zero grid, carbon emission for developments are to be reviewed in a more holistic way.

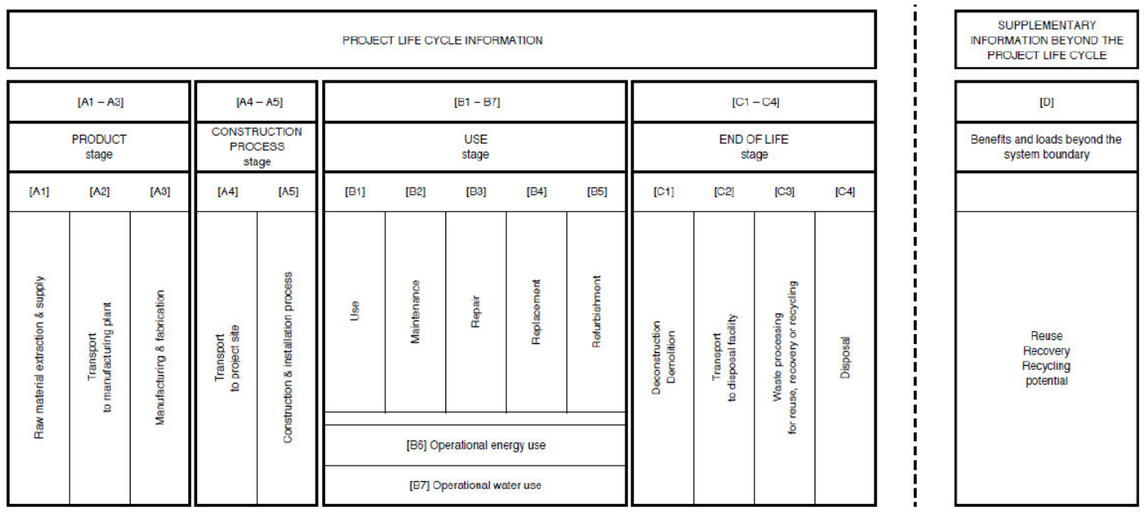


Figure 18 – Whole Life Carbon Assessment Stages

In line with the Barnsley SPD, at the appropriate detailed design stages for the future phases of the development, a Whole Life Carbon Assessment will be review / conducted in accordance with the RICS guidance.

This will outline where improvements and carbon savings could be made taking into account a full cradle to grave holistic approach to development and construction.

Summary

This statement has been prepared to address the planning policies CC1 – 'Climate Change', CC2 – Sustainable Design and Construction' and RE1 – 'Low Carbon and Renewable Energy' of the Barnsley Local Plan 2019.

As states, all developments will consistently prioritise an overall reduction in energy demand as the most effective way in which to minimise environmental impacts associated with energy use.

Incorporating the use of highly energy efficient technologies, in addition to low carbon / renewable technologies, and considering the fabric first approach by improvement to the fabric envelopes to the developments, it can be demonstrated that the planning polices will be adhered to throughout the construction phases of the overall development.

The proposed development will seek to follow the energy hierarchy throughout to reduce carbon emissions and energy demand.

The appropriate ecological, flood risk and transport plans have been put in place to ensure the wider impact of the development is lessened and improved where applicable.

The appropriate phases of the development will adhere to BREEAM Excellent requirements unless demonstrated to not be feasible. A pre-assessment will be undertaken at the appropriate times. This is above the minimum requirement of Very Good.

In addition, to satisfy the SPD, a Whole Life Carbon Assessment will be undertaken for all future phases to fully understand the embodied carbon of the development as well as it's predicted operation energy consumption allowing for improvements to be made.

The appropriate version of Building Regulations will be adhered to throughout the development construction phase should there be revisions incorporated to the Building Regulations throughout this time period.

All renewable and low carbon technology deemed feasible within this report will be reviewed accordingly as the appropriate detailed design stage.

In summary, this statement demonstrates compliance with Building regulations, all appropriate planning polies, BREEAM requirements, and SPD requirements.

Please note that the specifications noted within this Energy Statement may change through the detailed design process, however the ethos and standards will remain compliant.