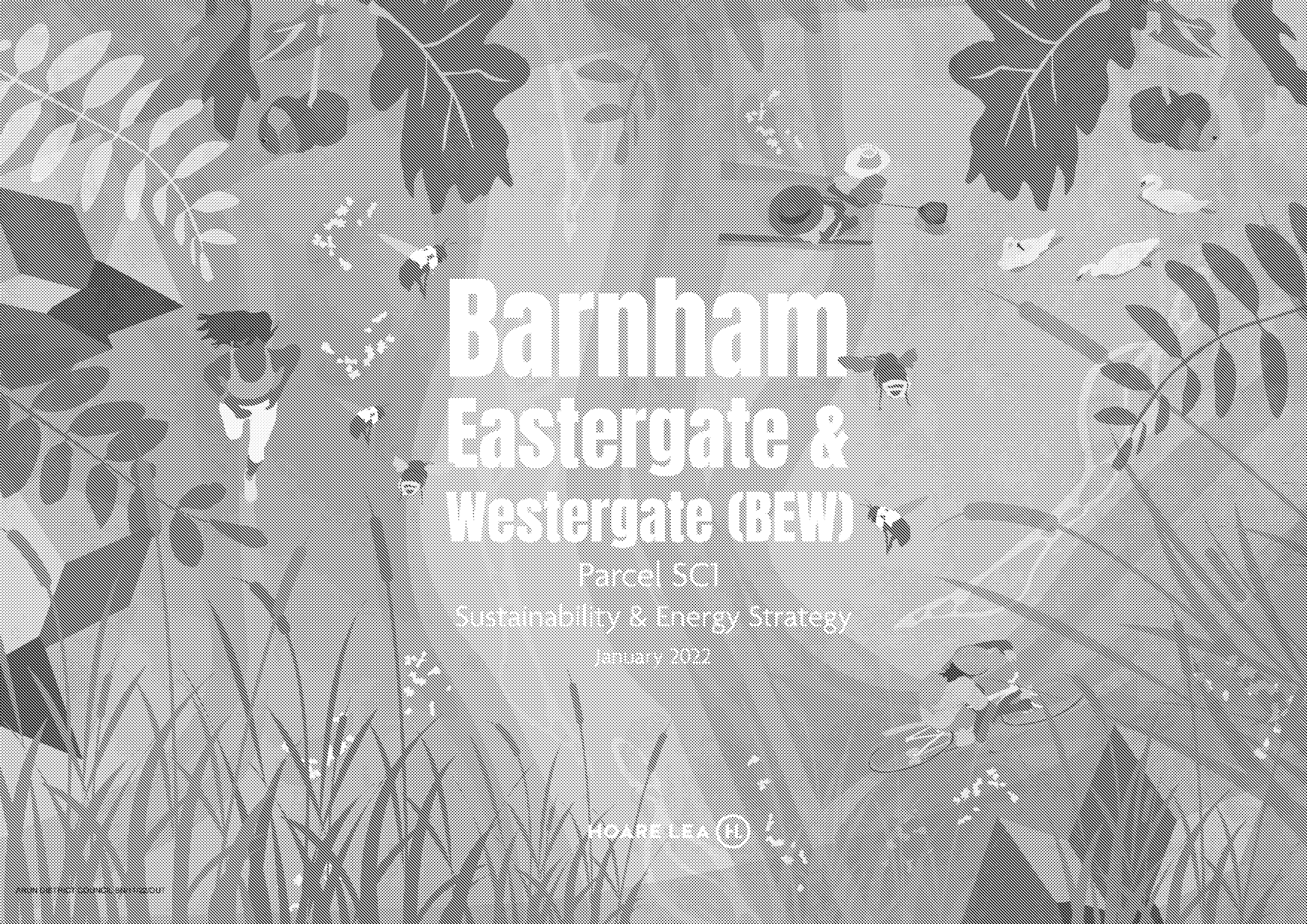




Barnham Eastergate & Westergate (BEW)

Parcel SCI
Sustainability & Energy Strategy

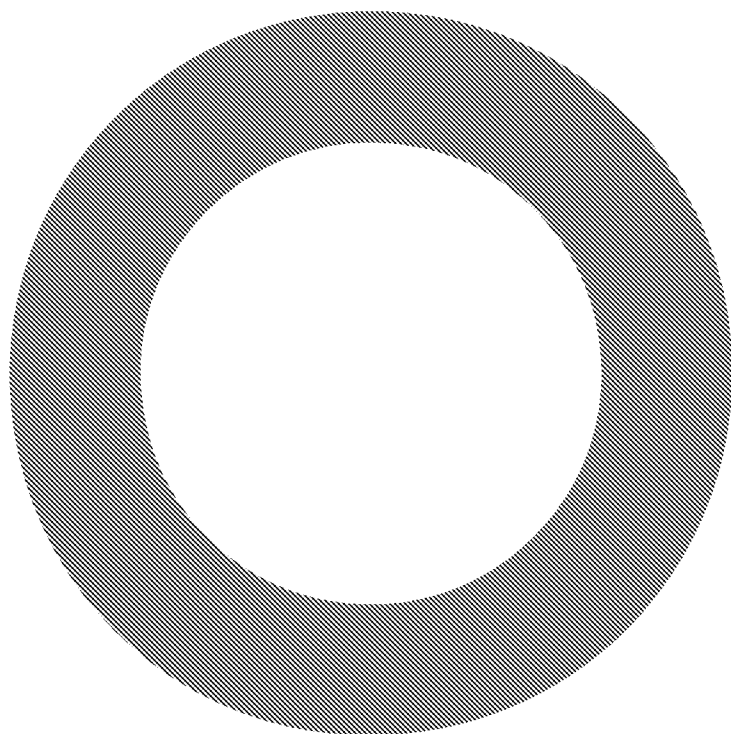
January 2022

HOARE LEA 

Land at Barnham, Eastergate and Westergate (BEW). Arun. C.C. Projects, Ashmarden Ltd and Hanbury (PM) Ltd.

SUSTAINABILITY
SUSTAINABILITY AND ENERGY STRATEGY

REVISION 09 – 31 JANUARY 2022



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	09/09/2021	Draft for submission.	N. Toolseram	E. Ray/T. Wigg	G. Jones
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08	28/01/2022	Update to exec summary	N. Toolseram	E. Ray	G. Jones
09	31/01/2022	Update to exec summary and introduction	N. Toolseram	E. Ray	G. Jones

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Executive summary.

Purpose of this report.

This report has been prepared on behalf of C.C Projects, Ashmarden Ltd and Hanbury (PM) Ltd in relation to the proposed development at BEW Parcel SC1, which forms part of the Barnham Eastergate and Westergate site allocation. The applicants have been promoting the development as the Southern Consortium and will be referred to as such. A strategy is proposed that works with nature and seeks to minimise its impact on the local and global environments, whilst creating a place which allows people to lead happy and healthy lives will be a central tenet.

This report has been prepared to support an outline planning application for the realignment of the A29 and residential led mixed use development of up to 1,250 new homes, a primary school, Neighbourhood Centre, open space and landscaping and other ancillary works.

It sets out the Southern Consortium's sustainable vision and ambitions for the site and is intended to be aspirational and illustrative with targets and opportunities that, given the long construction period, are subject to change as the development and energy and sustainable technologies evolve. The strategy itself is not submitted for approval therefore, although specific matters may be secured by planning obligation or condition if required by current planning policy, subject to consideration of all wider matters and development viability.

Key drivers.

The strategy responds first and foremost to the universal challenges of health and wellbeing, the climate emergency, and the extinction crisis facing humanity National and local policy will shape the baseline of performance of sustainability, with the UN Sustainable Development Goals alongside best practice principles of masterplan design, delivery, and operation shaping the strategy.

Approach to sustainability.

The strategy is based on five key factors: the Five Capitals of Sustainability. This approach is focussed on creating value with the aim to realise real term and tangible benefits.



FORM AND MOBILITY

Creating high quality buildings ensures PHYSICAL VALUE is increased where buildings and infrastructure project an image of design for longevity and allow people to navigate easily on foot/by bicycle.



COMMUNITY AND PLACE

By enabling community identity, SOCIAL VALUE is increased where a great place brings people together and creates a community.



ECONOMY AND PROSPERITY

By ensuring equity for all, ECONOMIC VALUE is increased where all users of a place feel they have a level of ownership of the asset and buy-in to the outcomes it is seeking to achieve.



HEALTHY BY DESIGN

With a focus on people, HUMAN VALUE is increased where quality and longevity of life is improved and happiness is increased.



ENHANCING THE ENVIRONMENT

By seeking to achieve positive gain, NATURAL VALUE is increased where existing quality is protected and new complementary resources are introduced.

Figure 1: The Five Capitals.

Outline objectives.

The following details the high-level objectives set for the Proposed Development and some emerging approaches to achieving them on site.

1

A masterplan which connects the community through a network of safe and inviting routes for active travel.

The Proposed Development aims to create a distinct but connected community, both physically and socially. The design of places, spaces, and the routes between them would focus on creating a feeling of familiarity, where key amenities and facilities, both within the Proposed Development and in neighbouring communities, are appropriately located and easily reached through a network of active travel routes designed with safety and continuity at the forefront.

2

Build high quality homes for all to love with flexibility and accessibility at their heart.

Designing and building a range of homes to be energy efficient, comfortable, and promoting good levels of health and wellbeing is a key tenet of the strategy. Ensuring these homes are designed to be as flexible and adaptable for people of all ages, lifestyles and abilities is the ultimate goal.

3

Embrace the countryside and allow it to give the Proposed Development a distinct identity.

The design of the Proposed Development is one that celebrates and works sensitively around the countryside setting of its surrounding neighbours whilst ensuring creation of a place that is vibrant and distinct in identity for future communities.

4

Provide a future proofed and resilient energy strategy which supports and enables net zero carbon.

The Proposed Development could implement a flexible and efficient energy strategy that is optimised appropriately as the development comes forward and for the current energy landscape, yet forward looking to adapt to future changes, and remaining sensitive to the global challenges of climate change and biodiversity. The Consortium and its development will explore routes to net zero carbon operation by seeking to minimise demand, supply remaining demand efficiently, and maximise the provision of on-site renewables.

5

Placemaking which brings people together.

The Proposed Development, including neighbourhoods, green spaces, local centre and everywhere in between, will be designed and maintained to be a welcoming and safe place, ensuring good visual and functional aesthetic, catering for a variety of uses and demographics and, ultimately, bringing the community together.

6 Give people a voice and ensure it has meaningful influence on the design.

A robust approach will be undertaken within the formulation of the framework masterplan to ensure all stakeholders have the opportunity to contribute to and see the design meaningfully respond to their suggestions where possible.

7 Ensuring that a variety of amenities are available and easily accessible by existing and future residents.

The Proposed Development will provide additional supporting amenities to the local area, ensuring that locals needs are met within an accessible and safe distance to their homes.

8 Committed to managing construction sites in an environmentally and socially considerate manner

The Southern Consortium recognises the importance of ensuring construction sites are managed in an environmentally and socially considerate, responsible, and accountable manner. Therefore, they will encourage contractors to register with the Considerate Constructors Scheme.

9 Create good quality employment to support and complement the local economy.

The Proposed Development will generate a range of economic opportunities and it will seek to maximise the benefit to the local area by seeking to complement, not compete, with local businesses. It will seek to create a range of high-quality jobs and training opportunities by providing supporting amenities and facilities that will attract businesses to the local area.

10 Enable flexible and dynamic working and adapt to the new normal.

The demand for flexible and home working has been brought to the fore recently, and the Proposed Development will seek to align with the future of the market needs and facilitate a seamless transition to a range of work styles and environments to suit an increasingly diverse range of needs, particularly focussed on exploring providing high quality broadband and mobile connectivity to facilitate flexible working.

11 Sustainable procurement of goods and services to boost local economy.

The Proposed Development will explore opportunities to invest in the local economy by seeking preferential appointment of suppliers, contractors, and consultants from the local region during construction, where practical. The Southern Consortium, alongside its development partners, will seek to minimise the environmental impact and maximise the social benefit of the construction and operation of the Proposed Development.

12 Invest in the community, both new and existing.

The Southern Consortium seeks to not only invest in the physical development – the bricks and mortar – but also in the community. This includes both existing communities, recognising the significant value nearby residents can bring to supporting and establishing the new community in the early stages, and the new residents who will make the Proposed Development a welcoming and exciting place to live for decades to come.

13 Put physical and mental wellbeing at the core.

The Proposed Development recognises that people are more than their objective needs. Therefore, the Proposed Development will seek to optimise occupants' mental and physical wellbeing by providing high quality green and amenity spaces and a variety of leisure facilities. These amenities are for future and existing communities to enjoy as space for socialising, exercising, and relaxing.

14 Create healthy and active places to live, work and play.

The design of the Proposed Development should be as human-centric as possible, maximising occupant comfort and health, and ensuring a safe and secure environment to live, work and play. Active design principles encouraging an active population will be at the heart of the urban design.

15 Improving health without compromising on comfort.

The Southern Consortium is committed to building a community that is happy, healthy, safe and comfortable. Therefore, the Proposed Development will ensure that design elements and features which address issues with indoor air quality, acoustic performance, daylighting and security are considered at the outset and incorporated within the reserved matters submissions.

16 Inclusive design enabling accessibility for all.

By embedding the principles of inclusive design, the Proposed Development is designed to allow people of all ages and abilities to thrive and succeed.

17 Create a network of varied and connected habitats which celebrate nature and achieve a net gain in biodiversity.

The Proposed Development seeks to ensure that existing habitats are protected and new networks of varied and connected habitats are incorporated to ensure that the Site develops a net increase in ecological value. The Proposed Development will ensure that urban design does not compromise the natural environment but celebrates it across the development for the benefit of people and wildlife.

18 Efficient use of natural resources by employing the principles of circular economy.

The design of the Proposed Development would be underpinned by principles of resource efficiency, seeking to minimise the consumption of water, use of materials, and the generation of carbon and waste throughout the lifecycle.

19 Convenient and inviting linkages through landscape brings people closer to nature.

By considering how the development interacts with the surrounding environment, the Proposed Development's illustrative masterplan includes enhanced and improved accessibility to green spaces by extending fingers of landscape through the streets. All homes are within close walking distance of a dedicated green space.

20 Ensure resilience in a changing world.

As the Proposed Development is delivered, consideration will be given to the need for adaptability and flexibility in designs, ensuring resilience to a changing climate, ready for dryer, hotter summers and wetter winters prone to more extreme weather events. It would also be ready for changing technologies and lifestyles, ensuring it is a place that adapts, not conflicts, with an evolving society.

Conclusion.

The Proposed Development presents a unique opportunity for large-scale strategic development in Arun. In combination with the Southern Consortium's aspirational, people-centric, and environmentally robust approach to masterplan design and development, the Proposed Development has the propensity to be an exemplar development, delivering value for both existing and new communities.

The approach taken will focus on creating value in each of the Five Capitals to deliver sustainability holistically. The emerging proposal considers physical, social, economic, human, and natural issues with commensurate weight, responding to local sensitivities and seeking to go far beyond compliance-led design to create a truly brilliant place.

“The Proposed Development is designed to be **fit for the future**, stitched into the surroundings to establish **integrated communities**, creating a **complementary economy** which promotes inward investment and placemaking which enables people to be healthy by leading **active lifestyles** and building **with nature in mind**.”

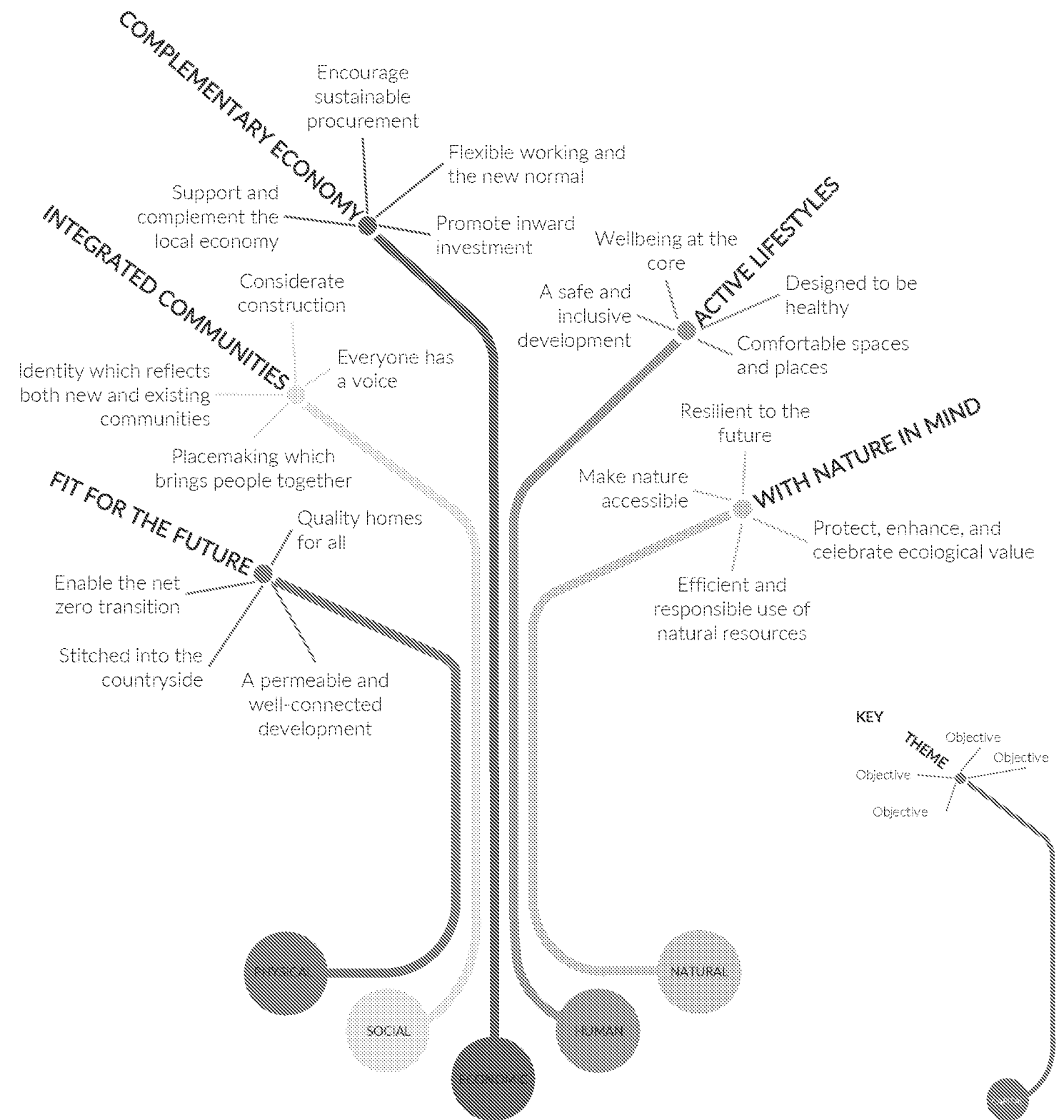


Figure 2: Approach to sustainability for the Proposed Development.

1. Introduction.

1.1 Purpose of this report.

This report has been prepared on behalf of C.C Projects, Ashmarden Ltd and Hanbury (PM) Ltd in relation to the proposed development at BEW Parcel SC1, which forms part of the Barnham Eastergate and Westergate site allocation. The applicants have been promoting the development as the Southern Consortium and will be referred to as such.

A strategy is proposed that works with nature and seeks to minimise its impact on the local and global environments, whilst creating a place which allows people to lead happy and healthy lives.

It sets out the Southern Consortium's sustainable vision and ambitions for the site and is intended to be aspirational and illustrative with targets and opportunities that, given the long construction period, are subject to change as the development and energy and sustainable technologies evolve. The strategy itself is not submitted for approval therefore, although specific matters may be secured by planning obligation or condition if required by current planning policy, subject to consideration of all wider matters and development viability.

1.2 The Site.

Development description.

Outline planning permission (with all matters reserved except for the A29 realignment) for the demolition of existing structures and mixed use development to provide residential dwellings (Use Class C3), care home/senior living accommodation (Use Classes C2/C3), flexible retail and community floorspace (Use Classes E/F2/sui generis), a primary school, plus associated open space, landscaping, drainage and all other associated ancillary works; and realignment of the A29 and early connection to existing A29, including construction of a new road carriageway, junctions and associated infrastructure.

The Proposed Development.

The vision is to create a unique place for a sustainable community, which is founded on a strong landscape and ecological enhancement strategy, extensive sustainable connectivity, and a set of distinct, linked residential neighbourhoods complemented by a range of amenities.

The key vision for the Proposed Development is that it will be a place...

- that provides a significant number of homes to fulfil local needs, including affordable homes and homes for the elderly;
- that is well connected and provides links and routes leading to the Neighbourhood Centre;
- encouraging living life outdoors, combining tranquillity with vibrancy;
- linking neighbourhoods together with leisure trails, and active travel loops; and with local routes which bring social life together and provide opportunities to meet;
- that is ecologically rich, protecting, enhancing and forming a key link within the Lidsey Rife corridor;
- connecting and protecting adjacent villages through landscape corridors and buffers.



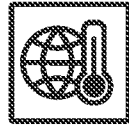
Figure 3: Red line boundary of outline application. Source: Fabrik.

2. Key drivers.

2.1 Universal Challenges.

People the world over face three universal challenges to which any sustainable development must respond effectively to be successful.

These are as follows:



Climate change

Last year, the Intergovernmental Panel on Climate Change (IPCC) confirmed via publication that, in order to mitigate the most devastating impacts of climate change, the world must demonstrate net zero carbon emissions by 2050. Reflecting this urgent call for action, the Committee on Climate Change published *Net Zero – The UK's contribution to stopping global warming*, identifying a route for the UK to achieve the net zero target. The UK government then joined a number of other nations in declaring a **Climate Emergency** and the target was ratified into law, meaning the UK has a legally-binding obligation to reduce its emissions to zero by 2050 at the latest.

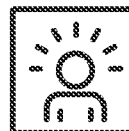
The UK's homes contribute over 25% to our national greenhouse gas emissions footprint, so any new residential-led development must minimise its footprint on day 1, and demonstrate a realistic route to achieving net zero carbon in future in order to align with our commitments to national decarbonisation.



Biodiversity

As a consequence of the warming climate, deforestation and habitat destruction, pollution and other human processes, the world is in experiencing an **extinction crisis**. It is estimated that human action is causing the rate of extinction to be around 1,000 times what could be considered a natural background rate and future projections estimate that 30% to 50% of all current species could be extinct by the middle of the century.

The need to provide homes and amenities for an ever-growing population are putting strain on our local ecosystems. Sustainable development must therefore mitigate its impact on local habitats, plants, and wildlife and contribute to a net gain in local biodiversity.



Health and wellbeing

Less of a crisis and more of a revolution, the understanding of the **importance of health and wellbeing** to happiness, productivity, community, and prosperity has become increasingly well-founded in recent years. Where someone lives and works is the primary influence on whether they are healthy and well and through the design of new development, people can be motivated to embrace active, healthy lifestyles and facilitated to be sociable, community-driven, and content.

2.2 National policy.

National Planning Policy Framework

The National Planning Policy Framework 2021 sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

Future Homes Standard, Future Buildings Standard and Part L consultations

Part L of the UK's Building Regulations was last updated in 2013. Since then, the UK's energy landscape has seen drastic change. The recent Future Homes Standard (FHS), Future Buildings Standard (FBS) and interim update to Part L seek to respond to these changes and establish the revised regulatory landscape for decarbonising the UK's building stock.

Future Homes Standard

The FHS was first issued for consultation in 2019, with the Government providing feedback on consultee responses in January 2021. The FHS proposes a significant uplift in minimum energy and carbon standards for new dwellings from 2025. A dwelling built to FHS is expected to achieve reduction in emissions of more than 75% compared to current standards. It is expected that these homes will be future-proofed with low carbon heating and high levels of energy efficiency.

As an interim step, updates to the Building Regulations Part L are to be implemented in June 2022 and will seek to act as a step change towards the FHS in 2025.

Future Buildings Standard

The Future Building Standard (FBS) comprises a newly launched consultation principally focused on delivering improved energy and carbon performance of non-domestic buildings.

The FBS proposes that:

- This new standard will apply to non-domestic buildings from 2025.
- There will be improvements to the non-domestic energy modelling methodologies.
- Improvements to standards when work is carried out in existing non-domestic properties.
- Ensure the transition of non-domestic buildings to use low-carbon heat sources for heating and hot water and become zero carbon over time (i.e. be zero carbon ready) as the electricity grid and heat networks decarbonise.
- Uplift in minimum energy efficiency and building services standards.

As an interim step, updates to the non-domestic Building Regulations Part L are to be implemented in June 2022 to act as a step change towards the FBS in 2025.

Building Regulations Part L 2021

Alongside the FBS consultation, updates to Building Regulations Part L for both domestic and non-domestic properties have been released. As noted above, it is intended that these will act as a step change to the 2025 FHS and FBS performance standards.

Buildings built to the new Part L 2021, as it will be known, are expected to deliver **a 31% or 27%** (on average) improvement in carbon emissions over current standards for domestic and non-domestic buildings respectively.

For domestic properties, compliance metrics for Part L 2021 will include:

- Primary energy target ¹
- CO₂ emissions target
- Fabric energy efficiency target

There will also be improvements to minimum performance standards for building fabric and building services.

Similarly, for non-domestic buildings, compliance metrics will be as follows:

- Primary energy target
- CO₂ emissions target

¹ Definition of primary energy used here is, 'energy from renewable and non-renewable sources which has not undergone any conversion or transformation process'. For example, the chemical energy contained in fossil fuels is a source of primary energy. However, a unit of electricity generated by burning that fossil fuel would not be considered primary energy because it has gone through a conversion process.

There will also be improvements to minimum performance standards for building fabric and building services as well as significant improvement in carbon factors for fuel types, most notably for electricity which will drive servicing strategies to all electric solutions.

Considering primary energy first and foremost (rather than CO₂ emissions) and including a consideration of the affordability of a given servicing strategy, reflects the challenges and consequences of a shift to all-electric servicing strategies, including the increased demand on an already strained electricity grid and the likely increase in energy bills due to the higher relative cost of electricity compared to gas.

The Environment Bill on Biodiversity Net Gain

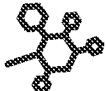
Following the consultation on mandating biodiversity net gain (BNG) in development last year, the government used their autumn Environment Bill to mandate ‘biodiversity net gain’. Announced in the Queen’s speech, it was confirmed that new developments must achieve a biodiversity net gain of 10% using the Defra BNG toolkit.

The Environment Bill achieved Royal Assent through Parliament on the 9th of November 2021.

Local policy.

Table 1 below provides a summary of key pertinent local planning policy of Arun District Council (ADC). In addition, ADC is currently exploring opportunities for the development of an action plan with milestones to make the activities of the Council **carbon neutral by 2030**.

Table 1: Arun District Council policy summary.

Theme	Arun Local Plan 2011-2031	Arun District Design Guide
	- ECC SP1: Designed to adapt to impacts arising from climate change. - ECC SP2: Produce 10% of the total predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. - ECC DM1: Support proposals for appropriately located renewable energy development.	- K.01: Embrace passive design and implement high standards of energy efficiency. - K.01: Mitigate the impacts of climate change by reducing greenhouse gas emissions in line with the ‘Energy Hierarchy’.
	W DM3: Integrate Sustainable Urban Drainage Systems (SUDS) and other flood risk mitigation including 30% allowance for climate change on stored volumes.	K.02: Minimise the consumption of potable water targeting <110l/person/day following the water hierarchy
	WM DM1: Opportunities for the re-use and recovery of materials on site must be demonstrated and off-site disposal of waste must be minimised and managed.	K.02: Circular economy principles aim to reduce the impact of resource consumption through promotion of natural and bio-based materials, designing out waste, pre-fabrication and effective deconstruction, and building in capacity for future adaptability
	D SP1: Development proposals should adhere to objectives informing sustainable design (inclusivity, adaptability, security, attractiveness, usability, health and wellbeing, climate change mitigation and	

Theme	Arun Local Plan 2011-2031	Arun District Design Guide
	habitats); and the influence these objectives have on the form of the development.	
	- ENV DM5: Achieve a net gain in biodiversity, protect existing habitats on site and apply biophilic design to provide connection to the natural environment. - ENV DM5: Facilitate the emergence of new habitats through the creation of links between habitat areas and open spaces.	
	- T SP1: Ensure that development provides safe access on to the highway network; contributes to highway improvements and promotes sustainable transport, including the use of low emission fuels, public transport improvements and the cycle, pedestrian and bridleway network. - T SP1: Proposed developments need to be supported by an effective and deliverable Transport Assessment	
	HWB SP1: Promote healthy communities and reduce health inequalities.	K.06: Providing necessary infrastructure to encourage physical exercise and health, including accessible open space, sports and recreation facilities (including outdoor fitness equipment) and safe, well promoted, walking and cycling routes
	QE DM3: All major development proposals will be required to assess the likely impacts of the development on air quality and noise impact and mitigate any negative impacts	K.05: Proposals should be informed by Noise Assessments, Air Quality Assessments and Lighting Assessments

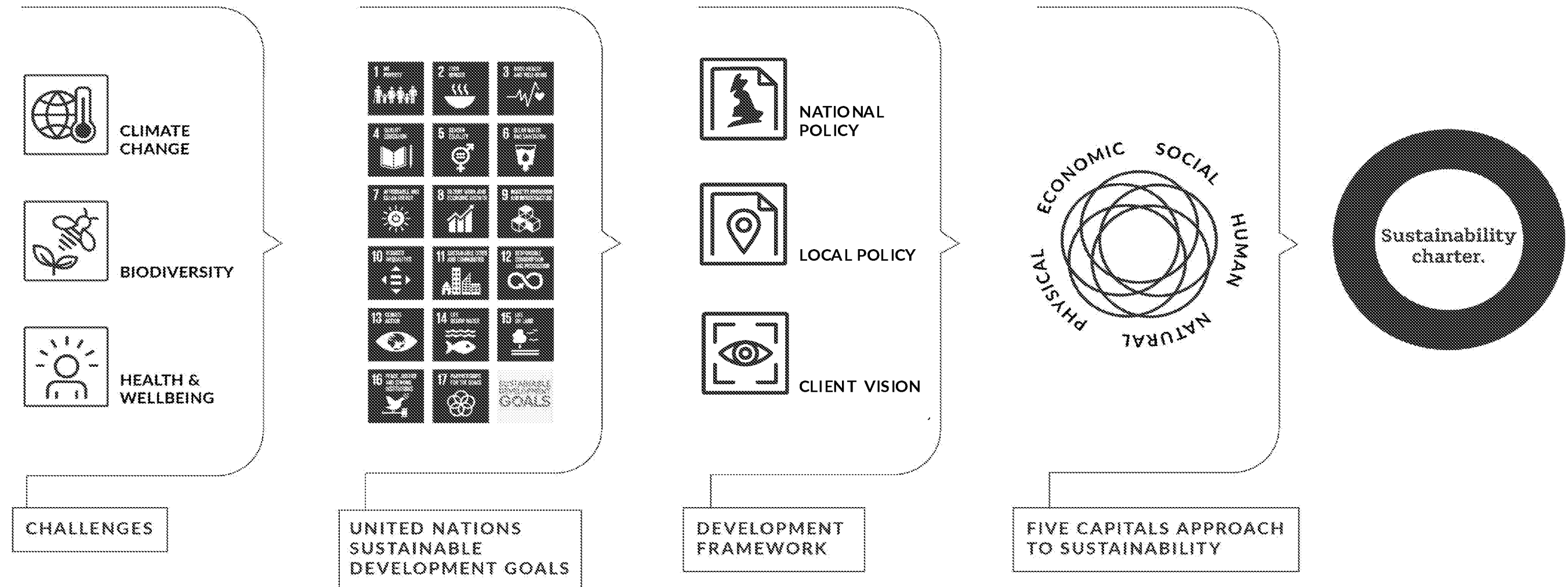
3. Approach.

3.1 Pathway to sustainable development.

As illustrated in Figure 4 below, the pathway to sustainable outcomes requires global thinking and local action. The pathway includes the following considerations:

- The three key challenges to such a development, as identified by the Southern Consortium, including climate, biodiversity and health and wellbeing.
- United Nations (UN) sustainable development goals.
- National and local policy.
- Landowner/client vision.

The emerging strategy for the Proposed Development will follow this hierarchical approach, ensuring that each aspect responds not only to the local policy and context of the site, but with understanding of its regional, national, and global impact and responsibility to first avoid before mitigating its contribution to the climate emergency and extinction crisis, whilst positively facilitating residents to be healthy, happy and well.



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Figure 4. Pathway to sustainable development.

3.2 The Five Capitals Model.

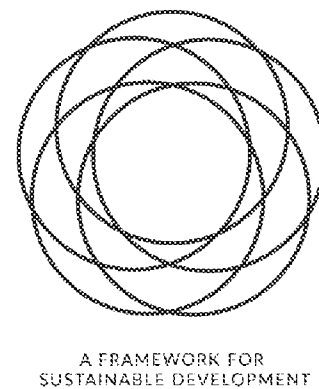
The sustainability strategy for the Proposed Development is based on sustainable design and construction principles as informed by planning requirements, industry best practice and the Applicant's vision.

The model

It is on this basis that the strategy is based on five defined factors: the Five Capitals of Sustainability.

Figure 5 captures the multi-faceted sustainability benefits and values that the Proposed Development would potentially bring to the site, local community, surrounding businesses, and future development users.

This approach is focussed on creating value with the aim to realise real term and tangible benefits.



FORM AND MOBILITY

Creating high quality buildings ensures PHYSICAL VALUE is increased where the development projects an image of design for longevity and allows people to navigate easily on foot/by bicycle.



COMMUNITY AND PLACE

By enabling community identity, SOCIAL VALUE is increased where a great place brings people together, and creates a community.



ECONOMY AND PROSPERITY

By ensuring equity for all, ECONOMIC VALUE is increased where all users of a place feel they have a level of ownership of the asset and buy-in to the outcomes it is seeking to achieve.



PHYSICAL AND MENTAL WELLBEING

With a focus on people, HUMAN VALUE is increased where quality and longevity of life is improved and happiness is increased.



ENHANCING THE ENVIRONMENT

By seeking to achieve positive gain, NATURAL VALUE is increased where existing quality is protected and new complementary resources are introduced.

Figure 5: Proposed framework for sustainability.

Why?

The overall sustainability vision is based on five defined factors; the physical infrastructure, the social network, the economic gain, the people and the natural environment.

Physical

A development is much more than its buildings, but the buildings are the foundation upon which a community is built. The buildings will outlast most people, creating a lasting legacy of which residents who have shaped the community can be proud. The physical infrastructure, and the way in which this is integrated into the existing environment in a commensurate way, is the means by which value creation across the other four capitals is achieved.

Social

A development is only as strong as its people and communities. By maximising the social value created, the development is tailored to the needs of that community, allowing it to thrive. A successful development seeks to exist not in isolation, but to embed itself within the local community whilst maintaining its own character and identity. A development which facilitates and encourages a cohesive society both within itself and as part of a wider regional community generates pride and longevity.

Economic

Realising economic value unlocks value creation across all capitals, enabling positive, sustainable, and equitable growth and prosperity. A successful development seeks to create economic value for the developer and all those who live and work in the development. Providing a varied residential offer to suit a range of budgets and complementary employment opportunities helping to ensure sufficient local jobs in the development and local area strengthens the local market, encouraging inward reinvestment which allows a development to thrive.

Human

Individual experiences are unique and require an approach to development design which is sensitive to this and recognises the nuance and subjectivity of people's needs. However, there are environmental factors to which we, as humans, universally respond. We know that people are happier and healthier when they feel safe and supported, and their senses and basic requirements have been considered. This human-centric approach is about looking at both individual and collective needs – considering the diversity of human experiences, as well as the factors that bring us together to create a culture of inclusivity and balance.

Natural

Enhancing the environment is a key responsibility of new development, both within the local context and through contributing to wider climate and biodiversity challenges. The built environment is the most powerful influence on our natural world, and when considering how we add value we have to take a bold and ambitious approach that considers both what we can remove (in terms of negative impact) and what we can add (in terms of transforming an environment for the better). Ultimately, with the right approach, the built environment can exist and enhance our natural world in harmony.

Sustainability charter

A sustainability charter which capture the key objectives of this sustainable development has been developed and it identifies various metrics which will be utilised to set targets and monitored throughout design and operation to ensure the sustainable vision of this development is achieved.

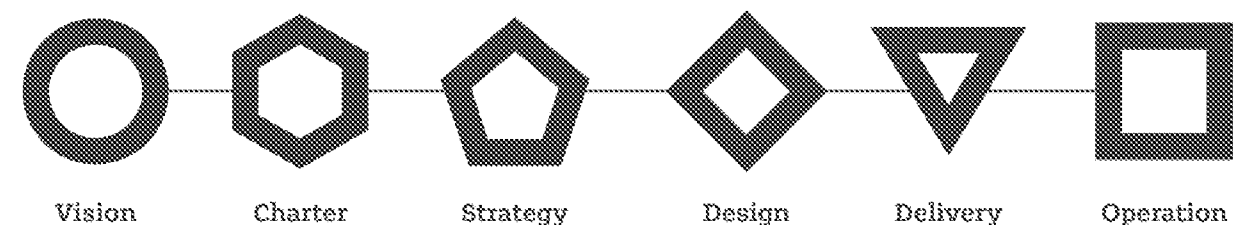


Figure 6: Sustainability strategy – delivery phase (inception to completion).

3.3 Approach to the strategy.

The design of the Proposed Development is based on high sustainability aspirations and standards. The strategy addresses key sustainability challenges and opportunities and confirms the applicable policies, the Southern Consortium's aspirations and sustainability measures that could be implemented at the Proposed Development.

It embraces the Five Capitals framework, responding to the challenges of climate, biodiversity and health and wellbeing, UN Sustainable Development Goals and Applicant vision, aiming to create long term value and generate a flow of environmental, social and economic benefits. Each Capital has been contextualised to the specific needs, challenges and opportunities arising from the Proposed Development.

The following sections discuss the Site and the emerging approach to delivering a residential-led masterplan within it in the context of the Five Capitals presented in Section 3.2. Certain strategic approaches are presented for illustration; these are subject to change as the development design evolves.

Relevant Arun polices to which each section responds are noted next to the subheadings (see Appendix B for policy references).

“The Proposed Development is designed to be **fit for the future**, stitched into the surroundings to establish **integrated communities**, creating a **complementary economy** which promotes inward investment and placemaking which enables people to be healthy by leading **active lifestyles** and building **with nature in mind**.”

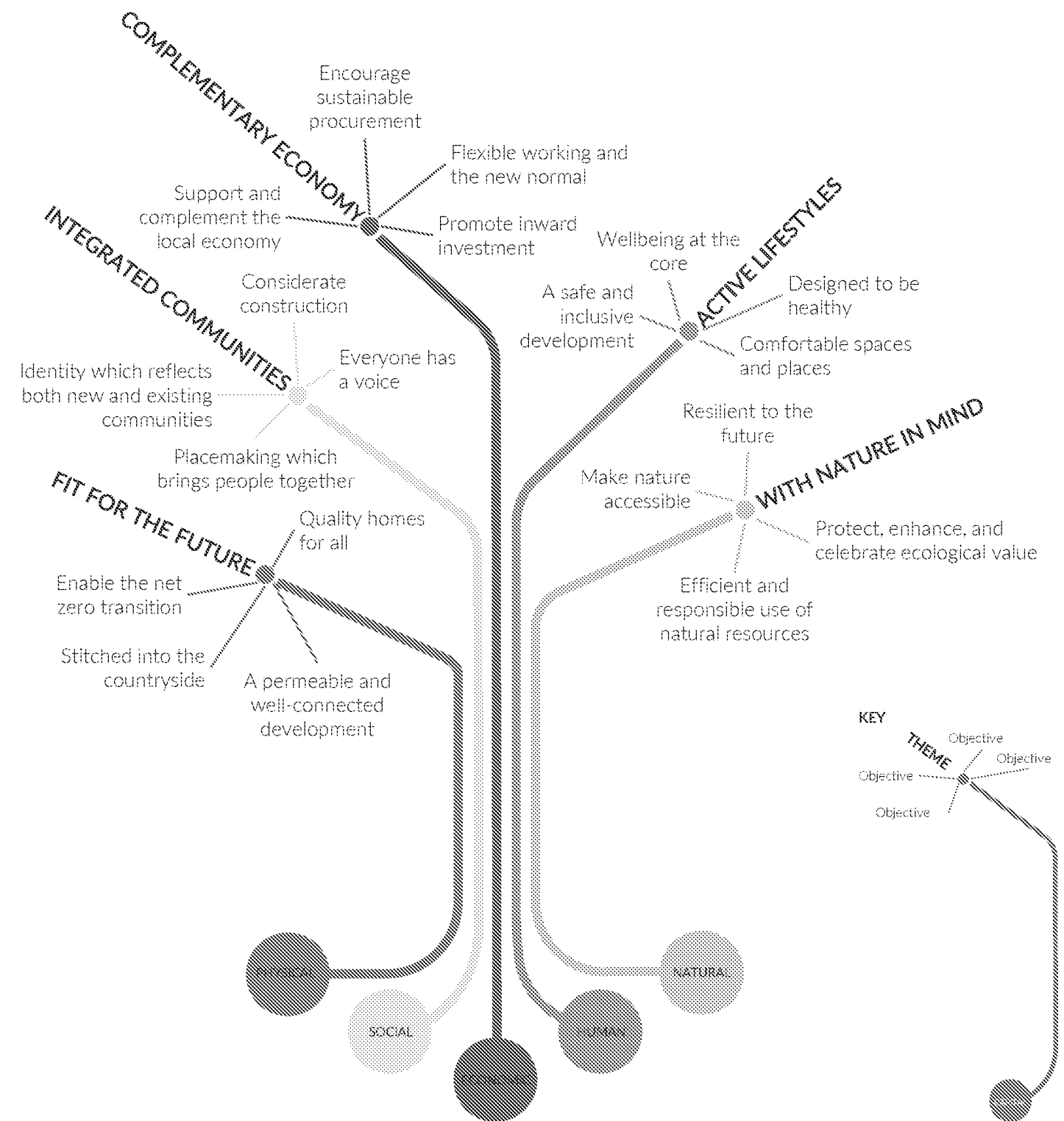


Figure 7: Approach to sustainability for the Proposed Development.

4. Physical Capital.

4.1 Purpose.

Ultimately, sustainable development must enable value creation by building transport infrastructure, social facilities, and high-quality homes which are commensurate to the context of the development site and surrounding areas. It is this physical capital which unlocks the creation of value in other capitals, facilitating communities of comfortable, content, and cooperative people to emerge, experiencing an equity of opportunity and the ability to thrive alongside and within a diverse natural environment.

Provision should respond to the needs and priorities of the local people and environment, established through appropriate consultation and study of local demographic data.

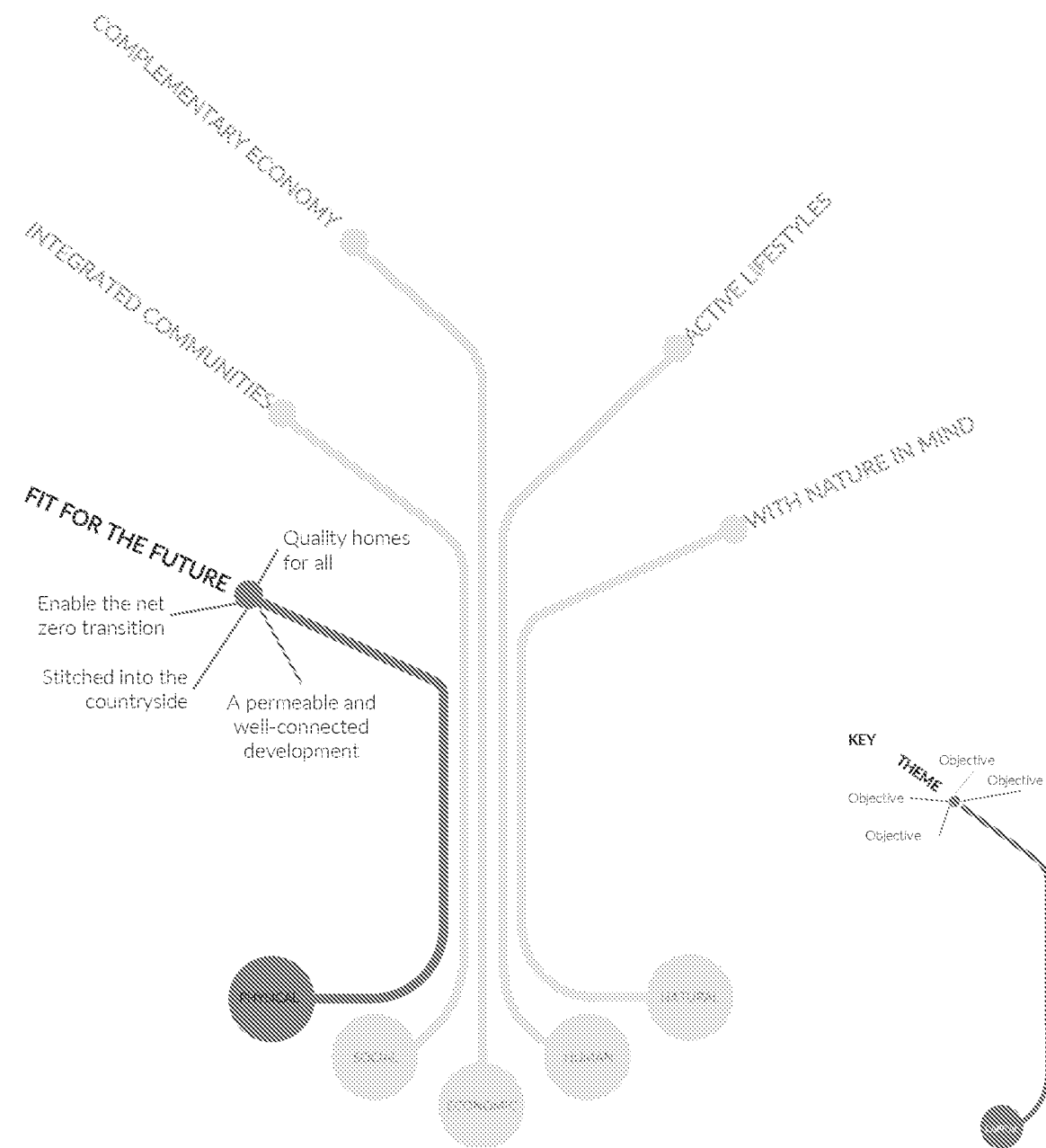


Figure 8: Physical Capital objectives.

4.2 Objectives.

1 A masterplan which connects the community through a network of safe and inviting routes for active travel.

The Proposed Development aims to create a distinct but connected community, both physically and socially. The design of places, spaces, and the routes between them could focus on creating a feeling of familiarity, where key amenities and facilities, both within the Proposed Development and in neighbouring communities, are appropriately located and easily reached through a network of active travel routes designed with safety and continuity at the forefront.

2 Build high quality homes for all to love with flexibility and accessibility at their heart.

Designing and building a range of homes to be energy efficient, comfortable, and promoting good levels of health and wellbeing is a key tenet of the strategy. Ensuring these homes are designed to be as flexible and adaptable for people of all ages, lifestyles and abilities is the ultimate goal.

3 Embrace the countryside and allow it to give the Proposed Development a distinct identity.

The design of the Proposed Development is one that celebrates and works sensitively around the countryside setting of its surrounding neighbours whilst ensuring creation of a place that is vibrant and distinct in identity for future communities.

4 Provide a future proofed and resilient energy strategy which supports and enables net zero carbon.

The Proposed Development could implement a flexible and efficient energy strategy that is optimised appropriately as the development comes forward and for the current energy landscape, yet forward looking to adapt to future changes, and remaining sensitive to the global challenges of climate change and biodiversity. The Consortium and its development will explore routes to net zero carbon operation by seeking to minimise demand, supply remaining demand efficiently, and maximise the provision of on-site renewables.

4.3 Measures being explored.

Energy strategy

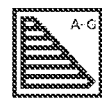
Local policies: Arun Local Plan ECC SP2; Arun District Design Guide K.02

The energy sectors in the UK have seen a dramatic change over the last ten years and are likely to remain subject to most dynamism in the coming decades. 'Locking in' a development to a single strategy or technology in a period of such rapid change in the energy sector would be short-sighted, and the strategy will remain flexible to existing, emerging, and disruptive technologies to deliver the most effective response at the time the homes and buildings are actually delivered.

The consequences of servicing homes and buildings without an eye on the future are plain to see in developments across the UK and to ensure the Proposed Development is resilient to change, the Proposed Development seeks to establish a future looking and flexible energy strategy. See Appendix A for more detail on the emerging Energy Strategy.

Approach

The Proposed Development approaches the emerging energy strategy using the energy hierarchy, prioritising reducing demand, before supplying energy efficiently and innovatively, and finally deploying renewable technologies. The servicing could focus on providing efficient systems which look to minimise demand on the grid, consequently minimising both CO₂ emissions and the cost of operation to the residents and tenants



Passive design and energy efficiency

Deploying building fabric with a high thermal performance which is built to minimise heat loss and designing commensurate proportions of glazing onto the facades of homes and building are some of the key measures that will be undertaken to reduce energy demand in buildings as far as possible. Sufficient glazing could be provided, balancing the need for good daylight and beneficial solar gain in winter against the need to reduce heat demand and to mitigate the risk of summer overheating in a warming climate.

Better fabric and construction will result in buildings which are more air-tight and this benefit must not come to the detriment of poor internal air quality. Solutions such as mechanical ventilation with heat recovery (MVHR) could be explored to mitigate this risk.



The servicing strategy

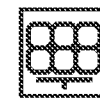
The strategy for the Proposed Development will be determined at reserved matters stage for the individual phases and will respond to energy landscape at the time of submission.

Noting the historic and future projected decarbonisation of grid-supplied electricity in the UK and the government's intention to remove the ability to install in gas boilers in new homes from 2025, progress and policy are driving a shift to electric heating in the UK. This would provide wide-reaching benefits to both greenhouse gas emissions and local air quality by avoiding burning gas.

With the foresight of the emerging Future Homes Standard which will invoke changes to Part L and Part F of the Building Regulations for new dwellings in 2025, the development recognises that an all-electric servicing strategy is likely to be a suitable approach to compliance.

The carbon intensity of grid-supplied electricity in the UK has reduced by almost 70% since 2012 and is projected to continue decarbonising to be zero at some point in the mid-2030s, according to National Grid projections (see Appendix C). By leveraging this continuing decarbonisation, an all-electric Proposed Development could be low carbon on day 1, reducing to net zero carbon emissions when the electricity grid becomes zero carbon by the mid-2030s.

One solution that could be explored is for all homes and buildings to utilise an electric heat pump, which allows the generation of heating, hot water, and cooling (where required) at very high efficiencies of 250% or more. This would have multiple benefits including reduced carbon emissions, lower energy bills, and minimising the strain on the local electricity grid.



Low and zero carbon technologies

Renewable generating technologies such as PV can be utilised to complement any servicing strategy. By generating zero carbon, renewable electricity on site, demand can be offset, reducing the strain on the local grid and reducing the development's carbon footprint.

Solar PV could be deployed on the homes and buildings themselves and opportunities to maximise the site-wide deployment of renewable generating technologies should be explored.

Appreciating the dynamism and rate of technological progress, the approach to renewables deployment would remain flexible to alternate and emerging technologies. However, electricity-generating technologies such as solar PV are broadly recognised as the most economic, lowest impact, and minimal maintenance solution currently.



Smart management and demand side response

As noted, the electrification of heat and transport is causing the UK's electricity grid to be increasingly strained. As such, the Proposed Development could seek to minimise and mitigate its impact on local grid resilience. Whilst reducing overall demand contributes to this, equally important is shifting demand away from times of peak demand on the grid i.e. between 5 and 7 in the evening.

This can be achieved through managing non-urgent demands intelligently, such as avoiding use of appliances during the evening. Energy storage at a building-level – provided through a dedicated electric battery, using an electric vehicle, or a hot water cylinder to store thermal energy – the consumption of electricity during peak times can be minimised.



Pathway to net zero carbon buildings

Whilst the buildings of the Proposed Development may not achieve net zero carbon operational emissions on day one, with electricity now lower in carbon than gas and projected to improve to net zero carbon by the mid-2030s, homes and buildings serviced entirely by electricity could be low carbon today, demonstrating a clear route to net zero carbon in the next 10-15 years, in line with the UK's legally-binding obligations to decarbonise.

Other emerging technologies, such as zero carbon hydrogen in lieu of natural gas will also be explored. As stressed, the strategy will remain flexible to the most effective route to achieving low carbon and low cost operation for residents in future.

Sustainable transport

Local policies: Arun Local Plan ECC T SP1; Arun District Design Guide I.01, I.02, I.03

The Proposed Development seeks to create a place where existing and new residents feel connected to the local area. This will be implemented through the delivery of a sustainable transport strategy that creates links for active movement across and around the site by ensuring new links connect with existing routes and paths.

Active transport such as public transport, walking and cycling will be prioritised within the Proposed Development. This is a fundamental part of the delivery of a sustainable, forward looking new community that reflects and yet influences the way people live, work and visit.



Shift to sustainable modes

According to the Department for Business, Energy and Industrial Strategy (BEIS), transport is the single greatest contributor to the UK's greenhouse gas emissions, accounting for 27% of annual emissions in 2018. Recognising the need to decarbonise this sector, future development must do everything possible to encourage a shift to sustainable modes.



First and foremost, this means facilitating and encouraging people to walk or cycle as much as possible. This could be achieved at the Proposed Development by making cycle and pedestrian routes safe, easy and inviting, therefore making these routes more convenient than driving within the development.



Figure 9 summarises the emerging access and movement strategy for the Site. This application features the A29 Strategic Road Corridor that runs from north to south of the site. Running across from it and through the neighbourhood centre is the main east-west link that provides a direct connection to Barnham Railway Station. Running around the perimeter of the application site will be dedicated footpaths and walkways that are intended to serve as a wellness trail for residents to enjoy.

The application incorporates an extensive network of cycling and walking routes as well as potential bus stops that establish active travel routes as the most convenient and attractive means for travelling to, from and across the site. All homes are currently designed to be within 0.5km of the neighbourhood centre and within walking distance of a public transport node. These routes are designed to be coherent, direct, safe, comfortable, and segregated from the main A29 road and the East-West link as per the latest national guidance.

In addition, a network of greenways, tree-lined paths exclusively for walking and cycling, will link to these routes and are proposed to run around the site. The wellness trail is expected to provide a slower, more circuitous route around the site for predominantly exercise and leisure journeys.

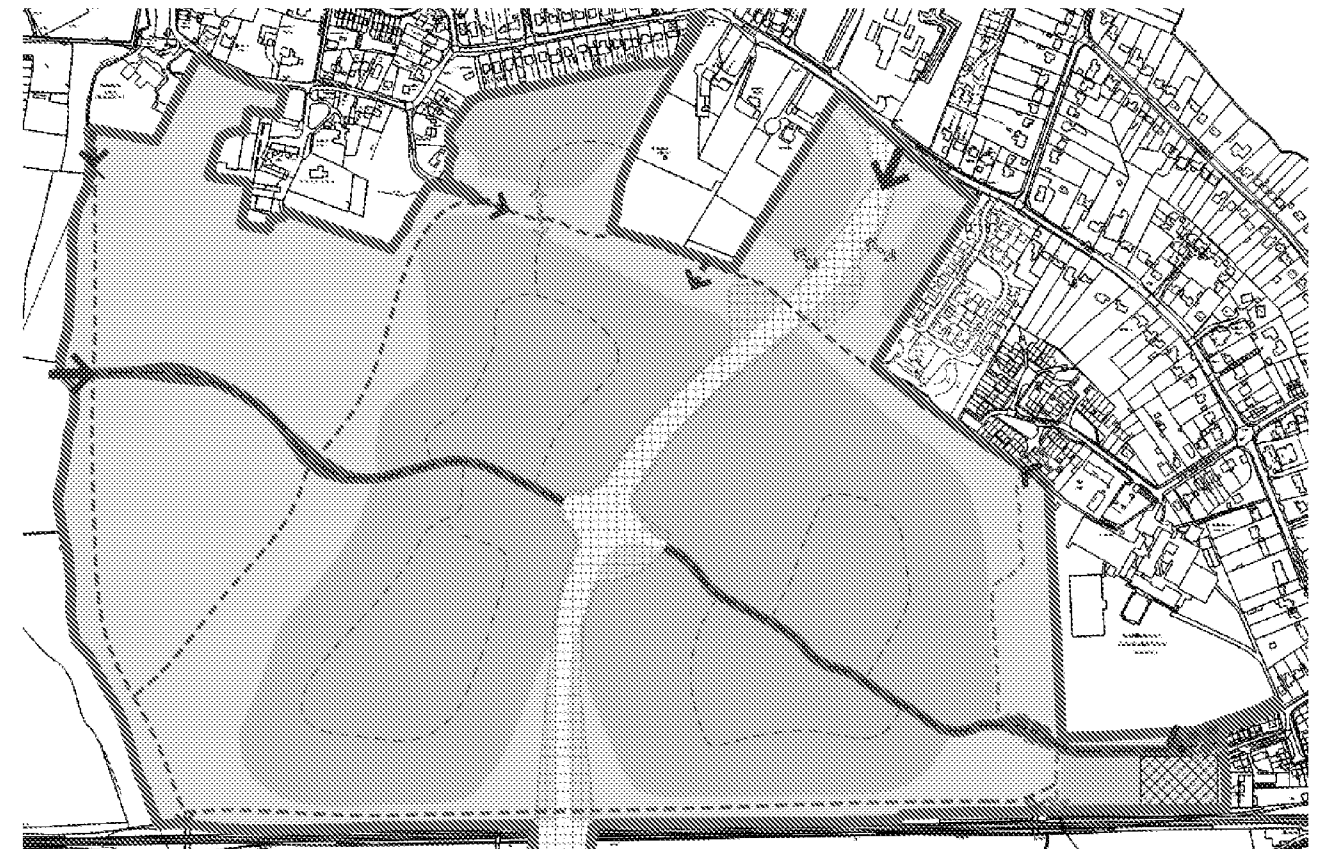
Discussions are ongoing with Stagecoach on the exact details of the bus service to be provided, and it is likely to be routed along the realigned A29 for a section of the route. Details of bus service provision will be subject to agreement and further discussions post-application.

Walking and cycling demonstrate a number of co-benefits for residents and the environment. The noted reduction in greenhouse gas emissions also results in cleaner air and quieter streets. Active modes of travel promote healthy people and a population who are walking and cycling within the development, rather than isolated within cars, are more likely to stop a talk to each other and take pride in their environment and community, fostering a cohesive society. Reflecting this the Proposed Development seeks to create a safe and secure walkable neighbourhood, with direct routes for pedestrians and cyclists. All roads will be designed to encourage reduced speeds and enable pedestrian priority.

In support of active travel across the site, the Proposed Development will include cycle provision within homes in line with parking guidance provided by Arun District Council.

Whilst ensuring routes through the development are safe, inviting, well designed, and plentiful, the strategy recognises that it is also important for the proposed development to knit into existing open space networks.

These cycle and pedestrian routes will connect both east-west and north-south, enabling all homes safe and direct access to the school, local centres and employment areas.



Key

- Outline Application Boundary
- A29 road corridor (refer to detailed highways drawings)
- Approved WSCC A29 scheme reference (WSCC/052/20)
- Parcel Access Routes (Indicative route, exact alignment to be confirmed at detailed design stage)
- Main Vehicular, Pedestrian / Cycle Site Access Points
- Indicative Location of Vehicular Connections Across Open Space
- Proposed Primary Pedestrian and Cycle Connection Points into the Site (Indicative locations, exact alignment to be confirmed at detailed design stage)
- Potential Alternative Pedestrian and Cycle Connection Point into the Site
- Proposed pedestrian and cycle routes (accommodates a wellbeing trail and includes upgrades to parts of existing Public Right of Way, indicative only and exact alignment to be confirmed at detailed design stage)
- Realigned Public Right of Way
- Proposed Additional Barnham Railway Station Car Park and Drop-off Facility (approximately 200 spaces)
- Secondary Road Corridor

Figure 9: Extract of access and movement parameter plan. Source: JTP.



Electric vehicles

Whilst the Proposed Development will seek to encourage and facilitate sustainable modes as far as possible, the context of the site will necessitate some level of travel by private car and this will still be the expectation of many future residents. To mitigate the impact of this need, the Proposed Development seeks to ease the transition to electric vehicles.

This could be achieved by ensuring local infrastructure provision is sufficient to accommodate the power demands of the future uptake of electric vehicles (EV) and that appropriate charging infrastructure is provided to homes and other buildings. Details of parking provision will be confirmed at reserved matters, but the Proposed Development has committed to exploring 'active' charging points for at least 20% of all parking spaces with ducting provided at all remaining spaces to provide 'passive' provision; allowing opportunity to upgrade to 'active' provision in the future. This is subject to overall site viability.

Understanding that the UK electricity grid is increasingly strained as we transition to a more renewable mix of electricity, the EV charging provision at the Proposed Development will explore enabling smart approaches to managing their demand to maintain local grid resilience. Managed charging and vehicle-to-grid technologies are still emerging but are likely to be essential in future, and the Proposed Development will seek to respond appropriately as the technology matures.

Ensuring flexibility to future innovation

The strategy would remain flexible to the possibility that the need for private car use may reduce or disappear in future, as technologies such as automated transport become mainstream.

Whilst ensuring walking and cycling is facilitated as far as possible, with cars given secondary priority, helps minimise the physical impact of this transition in future, the development would seek to remain as flexible as possible to future transport innovations. Designing streetscapes, which must currently facilitate car travel and parking, to be 'reclaimed' by pedestrians in future could be explored, avoiding the need for wide scale revision of transport infrastructure and public realm.

Resilience, flexibility, and adaptability

The approach to developing the site is to enable flexibility; creating a development with sight of what form the future may take, but avoiding locking it into one solution, one technology, or one way of living. Ensuring buildings, road networks, public realm, and community facilities are flexible enough to adapt to changing demands will ensure the Proposed Development remains effective and desirable far into the future.

The Proposed Development could seek to embed resilience, flexibility, and adaptability at the heart of the buildings' design, ensuring they can evolve to meet the needs of future communities and is built to a high standard to ensure they mature into a lasting legacy.

Recent months have brought to the fore what was already a guiding principle of delivering the Proposed Development: that it needs to be ready for a changing world. Access to green space and considered landscaping, superfast broadband, home working capacity and a strong sense of community are at the top of people's wish lists, both home owners and tenants.

The location of the Proposed Development combined with the size of the site and the significant green spaces mean that the homes could be brought forward within a framework which already meets many of these expectations. The detailed design for each phase would embed the design drivers and ensure a holistic standard is achieved by the house builders.

Resilience to environmental factors, such as climate change, flooding, air quality, noise, and others is also essential, and is discussed under the Natural and Human capitals.

Heritage and identity

Whilst foresight and flexibility are essential in delivering a successful development, the history and heritage of the Site should not be forgotten. The Proposed Development seeks to celebrate its existing heritage to

establish a legacy of which residents can be proud, incorporating features of local interest which nod to the history of the site whilst creating a new local identity for the new settlement.

A small part of the application site falls within the Church Lane Eastergate Conservation Area and this area contains a number of listed buildings including the Grade II* listed St George's Church and Grade II listed Eastergate House. St George's Church lies close to the boundary of the site and as such, the Proposed Development has been designed to respect the settings of the nearby listed buildings such as the protection of the setting and views to and from the Church.

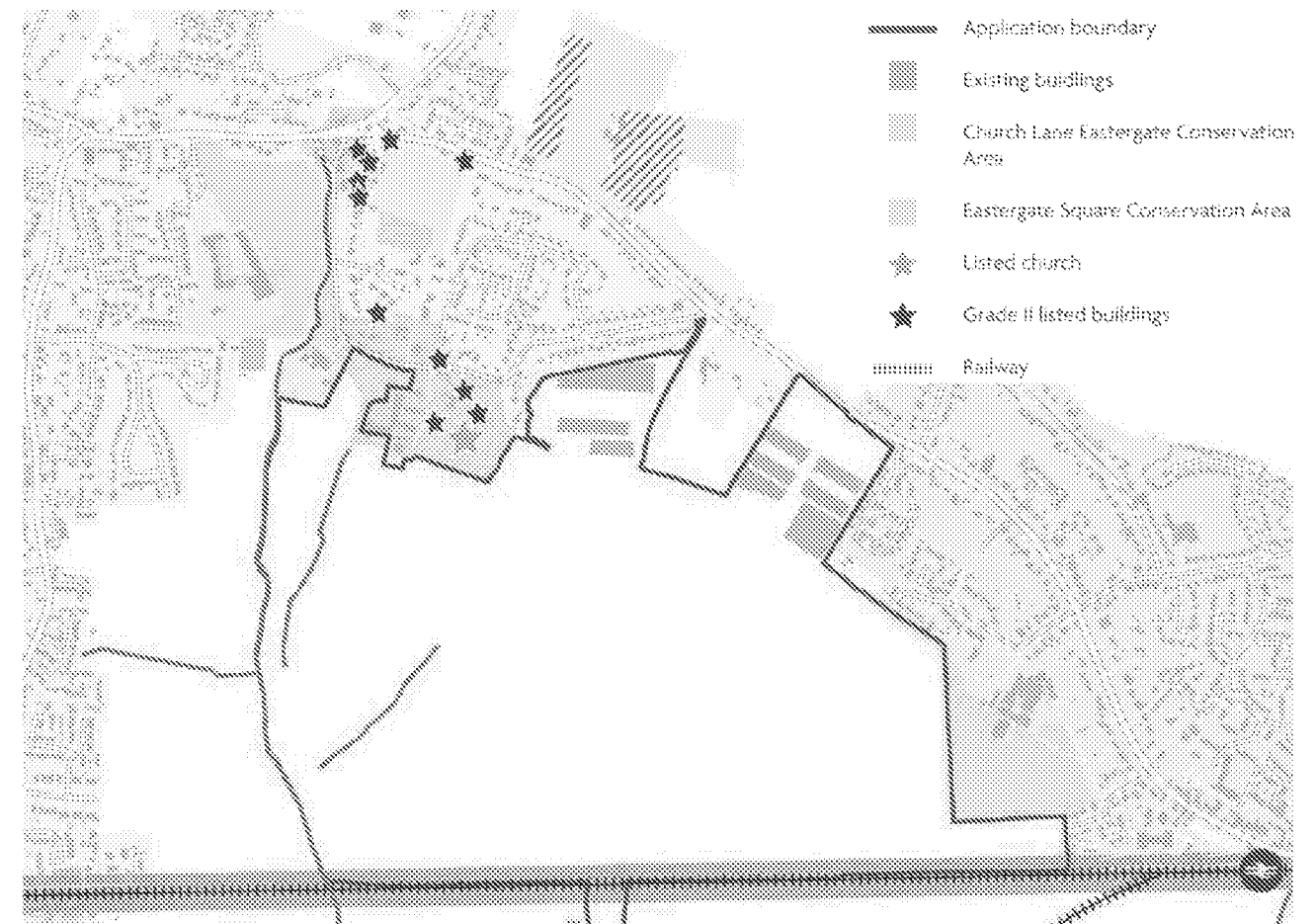


Figure 10: Heritage assets. Source: JTP

5. Social Capital.

5.1 Purpose.

The Proposed Development aims to take a whole-life approach to community cohesion. This means listening to the needs of the local community and engineering in solutions that facilitate sociability at the design stage, considering and mitigating the impact of the construction phases on the local and nearby communities, and through a process of ongoing management and stewardship, ensuring community strength and identity is a defining factor for years after the first building is occupied.

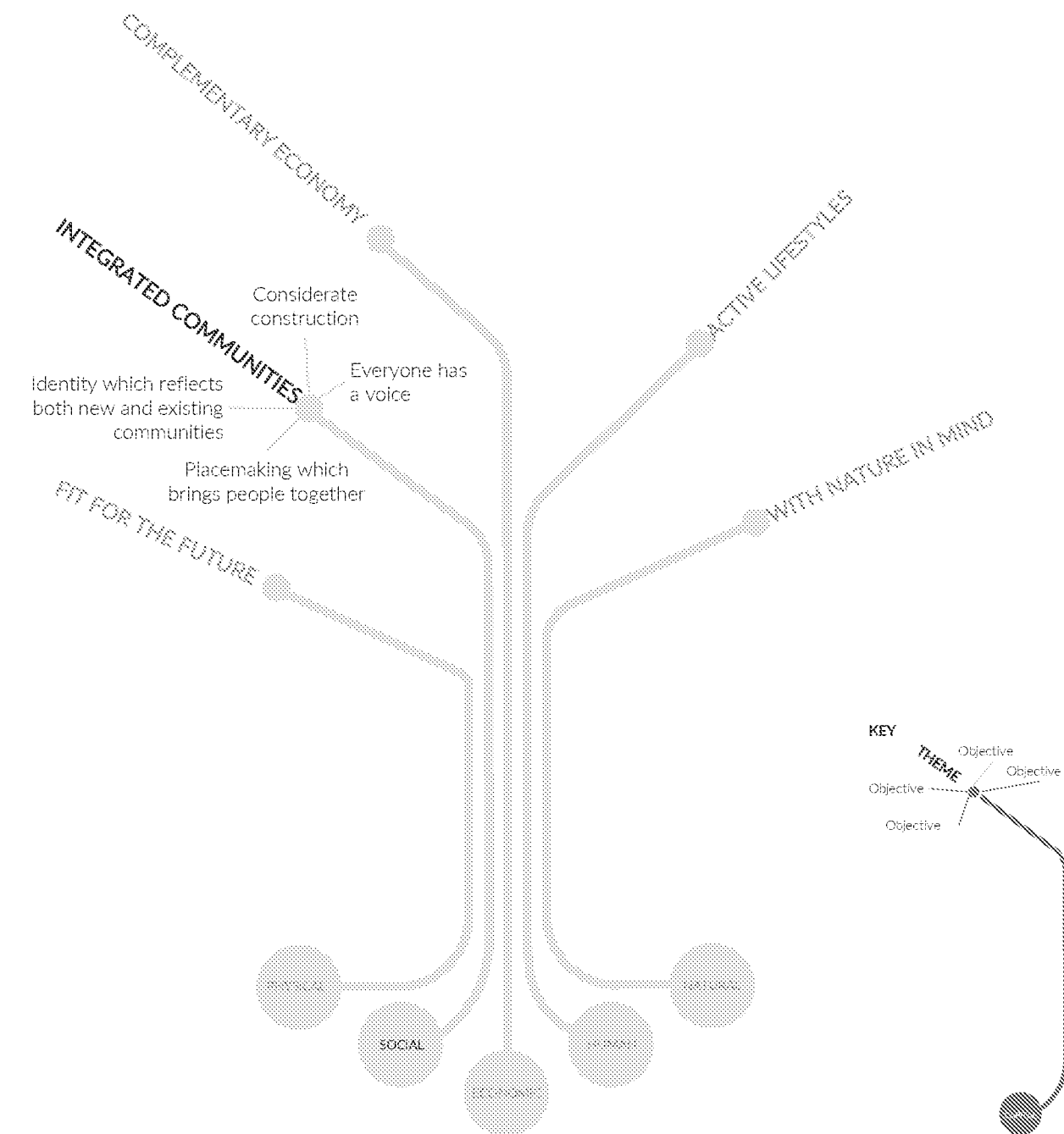


Figure 11: Social capital objectives.

5.2 Objectives.

5 Placemaking which brings people together.

The Proposed Development, including neighbourhoods, green spaces, local centres and everywhere in between, will be designed and maintained to be a welcoming and safe place, ensuring good visual and functional aesthetic, catering for a variety of uses and demographics and, ultimately, bringing the community together.

6 Give people a voice and ensure it has meaningful influence on the design.

A robust approach will be undertaken within the formulation of the framework masterplan to ensure all stakeholders have the opportunity to contribute to and see the design meaningfully respond to their suggestions where possible.

7 Ensuring that a variety of amenities are available and easily accessible by existing and future residents.

The Proposed Development will provide additional supporting amenities to the local area, ensuring that locals needs are met within an accessible and safe distance to their homes.

8 Committed to managing construction sites in an environmentally and socially considerate manner

The Southern Consortium recognises the importance of ensuring construction sites are managed in an environmentally and socially considerate, responsible and accountable manner, therefore they will encourage contractors to register with the Considerate Constructors Scheme.

5.3 Measures being explored.



Creating neighbourhoods

Local policies: Arun District Design Guide G.01

Creating distinct but sensitive character areas, or neighbourhoods, within the Proposed Development is central to the urban design strategy. Three broad areas of distinct character as described below have been identified as shown in Figure 12 and these are reflected in the outline planning application.

- The Mini Masterplan Urban Extension
- New Neighbourhoods
- The Neighbourhood Core

The Neighbourhood Core will provide a focal point for these character areas, providing a commensurate mix of facilities and amenities to serve the local community. Situated adjacent to the neighbourhood core is the primary school and playing field.

The community is fostered by bringing people together and inspiring positive behaviours. By giving the community a heart both physically and institutionally, this can be achieved.

Amenities, facilities, and public realm

Local policies: Arun District Design Guide F.01, G.01, H.03, H.04, H.06

Community amenities and the spaces between buildings are just as important as the buildings in which people live and work in bringing people together and establishing a community. The design responsibility for these spaces lies with the master developer and creating quality outdoor public spaces and facilities for people to enjoy forms a key ambition of the Southern Consortium' vision.

Creating a network of well connected, inviting, safe and diverse public spaces, complemented by a suite of amenities which respond to local needs, will enable people to lead sociable and active lifestyles, with a focus on health, wellbeing, and community. It is important that amenities are brought forward alongside the first houses and not left until the final phases, to ensure the first residents are not left stranded without access to key provisions. The construction of amenities will be phased to complement the residential development.

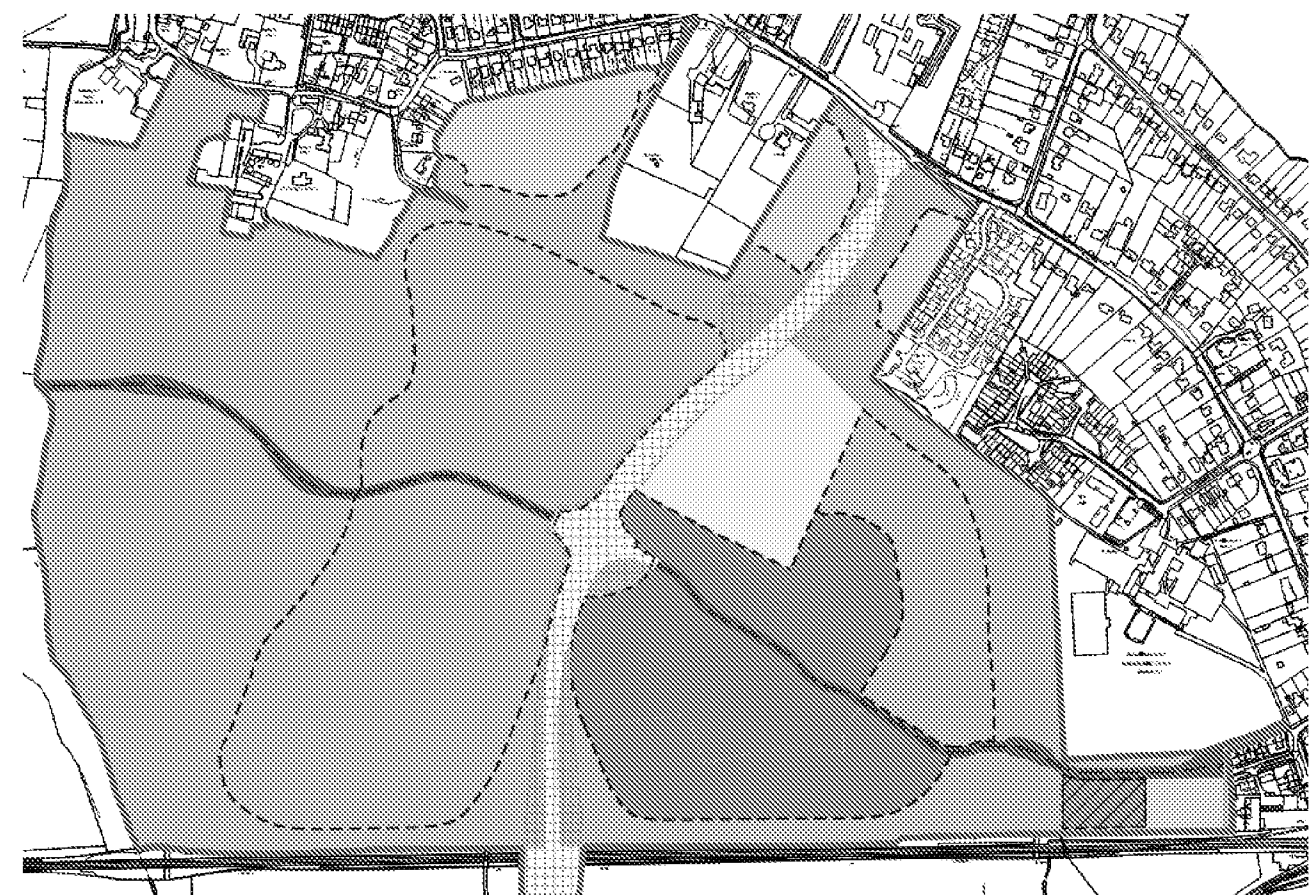
As shown in Figure 9 and Figure 12 active travel routes will be provided throughout the site to encourage residents to walk and cycle between their homes and their key local centre and employment facilities. The ecological fringe/wellness trail circumnavigates the entire perimeter of site and provides connectivity from within the neighbourhood centre to green spaces and green links.

The provision and mix of facilities to be provided at the Proposed Development, including educational facilities, and community infrastructure, responds to the needs and priorities of the local community, by reflecting the local plan requirements and listening to any specific needs established through a process of robust consultation. The offer will seek to generate maximal social value for the local and nearby communities and ensure that the Proposed Development is a self-sufficient, vibrant, and exciting place to call home.

Education

Education is a key consideration for any new strategic development and enabling local children to attend school near to where they live is a great benefit. The emerging masterplan will include a new primary school with a nursery and Special Educational Needs and Disability (SEND) provision which will be conveniently located adjacent to the Neighbourhood Core as shown in Figure 12.

By integrating the schools within the neighbourhood centre, the school forms strong links to the community and opportunities for outreach become far easier to capture when located near to other amenities. Furthermore, opportunities for the sharing of facilities to maximise utilisation and the breadth of amenities to be delivered could be sought.



Character Areas

- Mini Masterplan Urban Extension
- New Neighbourhood
- Neighbourhood Core

Figure 12: Character areas of outline application site. Source: JTP

Placemaking and social value

Creating social value is about understanding and responding to the specific needs of a place or community in order to enhance their quality of life. One can apply the best design principles to a development, but if it doesn't work for the existing communities or the new ones that will be established, the social value will be limited. Project-specific environmental, economic and social outcomes can be identified along with tangible key performance indicators (KPIs) to monitor progress and assess the benefits realised through the development.

Maximising social value has a large part to play in the creation of sustainable communities. By providing infrastructure, facilities, and services which reflect the socioeconomic, demographic, and cultural profile of the target communities, the Proposed Development aims to deliver maximum value to existing and new communities.

Varied network of spaces

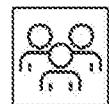
Local policies: Arun District Design Guide H.03

The strategy for the masterplan encompasses the provision of public spaces that are accessible and create a genuine sense of place, fostering strong relationships with local residents, workers and visitors, and supporting the services and activities that they want and need.

Across the Proposed Development, a network of interlinked green and social spaces are to be included to ensure that social value is embedded at the heart of the design proposals. Areas of the public realm could be supplemented by improvements in green landscaping that provide benefit to both biodiversity and resident wellbeing.

The landscaping could also reinforce the human affinity with nature. Sufficient seating and other features could be provided to offer opportunity for relaxation and reflection. Placing a wide range of amenity space such as this across the Site seeks to promote a balanced opportunity for social interaction, play, sport, leisure and relaxation; the Proposed Development could seek to ensure that all homes are within walking distance of a dedicated recreational space. This is discussed further under the Human and Natural capitals.

During operation, the Proposed Development could explore incorporating a management regime to maintain high levels of visual attractiveness, durability and environmental performance and discourage anti-social behaviour.



Public engagement

A key tenet of the Southern Consortium's approach to bringing forward the Proposed Development is to listen to what people have to say with empathy, sincerely reflect on it, and ensure the design and strategy responds where possible; this is engagement from the heart. A key enabler for creating communities and places for people is effective stewardship which begins with engaging with and listening to all relevant stakeholders through design and operation.

During early design stages, consulting with the existing local residents and community groups, industry bodies, and local and regional authorities and government is key to ensuring the development reflects local needs and priorities. Presenting the emerging design and listening to feedback helps further shape the development into something which the local and wider communities support and in which they have had meaningful influence, which encourages collective responsibility and civic pride.

During operation, effective stewardship to help the new community establish its identity, become cohesive, and enable people to express their ideas is essential. In the long term, the mark of a successful community will see the community stewardship made up of local representatives taking responsibility.

Stewardship in this way will form a key part of the ongoing strategy for the Proposed Development.

Community consultation will continue to inform the evolving design. It will ensure that public infrastructure is well maintained, giving local people pride in the place they live, again contributing to social cohesion and longevity.



Construction management

All contractors could be encouraged to sign up to the Considerate Constructors Scheme (CCS) as described within the Construction Management Plan (CMP) and demonstrate exemplary performance during the construction phase. Measures that could be implemented by the Contractor should cover the breadth of construction impacts and enable the Contractor to be a 'good neighbour' through construction and include:

- Vehicle movement – e.g. management access and egress, dedicated routes for heavy vehicles.
- Pollution management – e.g. minimise risks of air, land, light, noise and vibration pollution.
- Tidiness – e.g. the construction site is clean and clear and safe access is provided around the buildings.
- Health and wellbeing – e.g. processes and practices to promote health and wellbeing of site operatives, robust safety measures are in place.
- Security processes – e.g. minimise risk of site becoming focus of antisocial behaviour such as through CCTV, perimeter fencing.

6. Economic Capital.

6.1 Purpose.

Realising economic value unlocks value creation across all capitals, enabling positive, sustainable, and equitable growth and prosperity. The Proposed Development seeks to create economic value for the developer and all those who live and work in the development.

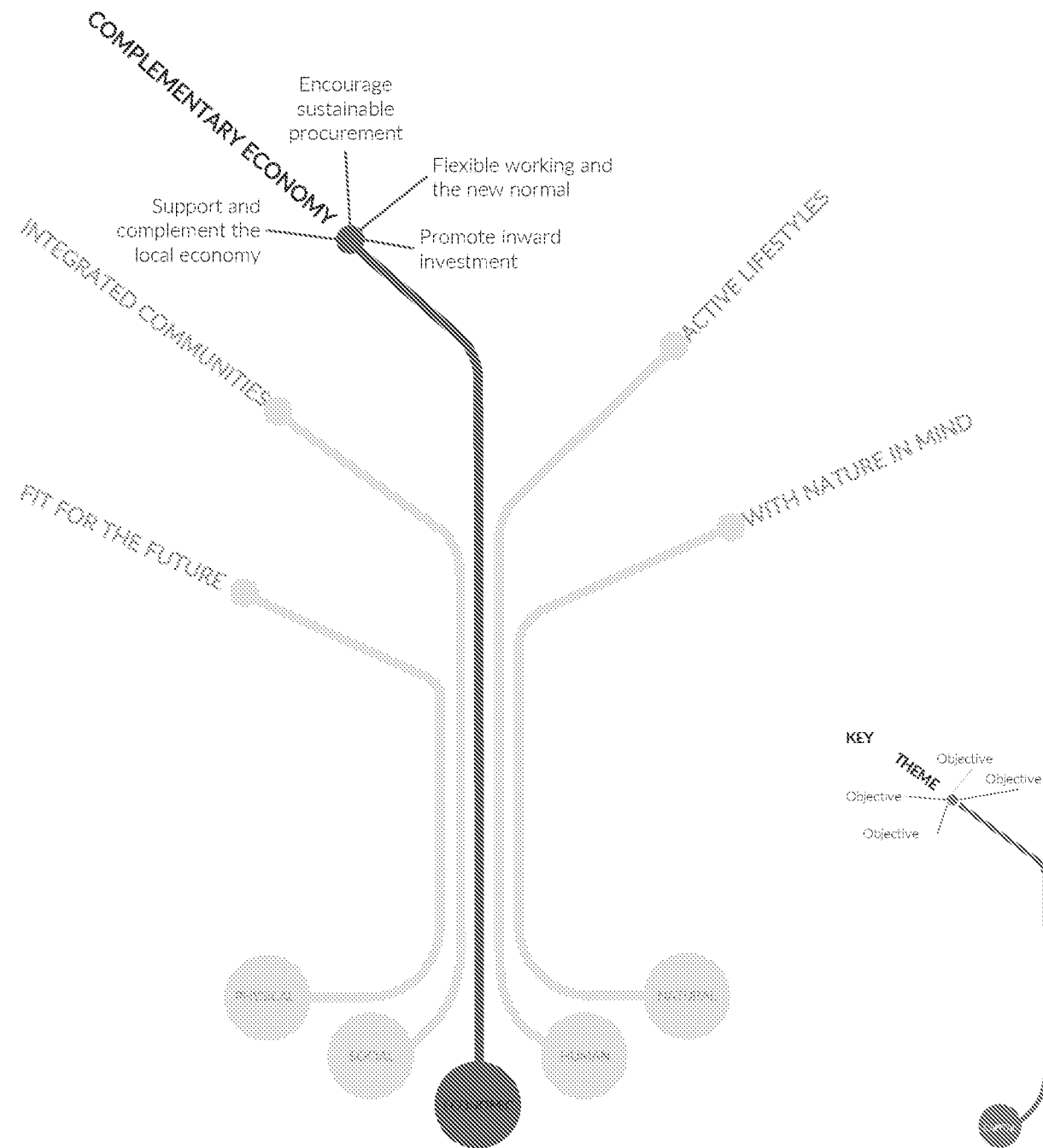


Figure 13: Economic capital objectives.

6.2 Objectives.

9 Create good quality employment to support and complement the local economy.

The Proposed Development will generate a range of economic opportunities and it will seek to maximise the benefit to the local area by seeking to complement, not compete, with local businesses. It will seek to create a range of high-quality jobs and training opportunities by providing supporting amenities and facilities that will attract businesses to the local area.

10 Enable flexible and dynamic working and adapt to the new normal.

The demand for flexible and home working has been brought to the fore recently, and the Proposed Development will seek to align with the future of the market needs and facilitate a seamless transition to a range of work styles and environments to suit an increasingly diverse range of needs, particularly focussed on exploring providing high quality broadband and mobile connectivity to facilitate flexible working.

11 Sustainable procurement of goods and services to boost local economy.

The Proposed Development will explore opportunities to invest in the local economy by seeking preferential appointment of suppliers, contractors, and consultants from the local region during construction, where practical. The Southern Consortium, alongside its development partners, will seek to minimise the environmental impact and maximise the social benefit of the construction and operation of the Proposed Development.

12 Invest in the community, both new and existing.

The Southern Consortium seeks to not only invest in the physical development – the bricks and mortar – but also in the community. This includes both existing communities, recognising the significant value nearby residents can bring to supporting and establishing the new community in the early stages, and the new residents who will make the Proposed Development a welcoming and exciting place to live for decades to come.

6.3 Measures being explored.



Attractive employment. **Relevant policies: SP1,**

The provision and mix of facilities to be provided at the Proposed Development, including educational facilities, and community infrastructure, responds to the needs and priorities of the local community. These are the very same elements that businesses are attracted to because it facilitates the ability to live and work in the same area. This reinforces local economic strength and stimulates local reinvestment.

The main employment area will be provided within the Neighbourhood Core as illustrated in Figure 12.

Businesses are attracted to areas with well-connected travel routes which links public spaces and green spaces because it facilitates a sustainable commute to work and access to nature at the doorstep of one's workspace.

The Proposed Development aims to pursue an equitable community by complementing a provision of affordable housing (subject to viability testing) with a range of job prospects to promote economic opportunities and social inclusion.

Ultimately, the economic role of the site is pivotal to the overall vision. The mix of amenities and facilities proposed will underpin the economic sustainability of the new community, supporting a successful mix of local economic activity, rooted in, and building on, local strengths and supporting policy priorities.

Flexible working and digital connectivity.

Recognising the diverse range of working patterns and environments required by the working population of today, particularly considering the changes catalysed by the COVID-19 pandemic, ensuring dwellings are equipped to facilitate homeworking could be explored. Additionally, opportunities to maximise the provision of alternative working facilities such as shared workspaces could be explored.

Ensuring all places, both commercial and private, have good access to high-speed digital connectivity through Fibre to the Premises (FTTP) and consistent mobile signal is essential to the employment strategy. Not only does it support the increasing trend of flexible working, but it is also essential to how commercial businesses function.

Contactless payment and social media advertisings are example of business features that were already on the rise before the pandemic but since March 2020 their usage and popularity has increased exponentially. Many retail businesses are only accepting card payment. These elements are considered vital to the success of any business and they are entirely dependent on reliable, secure, and fast internet connectivity.

Economic inclusion.

Considering the long-term economic impacts of the Proposed Development in the context of the local area is essential. The strategy seeks to ensure and enhance economic inclusion. This includes exploring the following measures at an appropriate time such as such as a procurement strategy which gives priority to local suppliers, particularly small- and medium-sized (SME) businesses. Supporting local business puts financial resource back into the local economy, stimulating prosperity for local communities.

In addition, the Southern Consortium could look to work with social landlords to maximise opportunities for local people in housing need.

Local procurement

The Applicant will seek opportunities at an appropriate time to buy from local communities where possible recognising the benefit of supporting local businesses and trades. Offering apprenticeships that prioritise local people could be explored which could contribute to upskilling the community.

Education and outreach

Opportunities are realised through access to education, which empowers people to better themselves, learn new skills, and gain qualifications which allow them to pursue their aspirations.

Recognising that everyone is different, this necessitates a range of different ways in which people can engage with education, from formal schooling, to vocational initiatives, through to embedding informal educational elements within the design and implementation of the Proposed Development.

The Applicant will explore opportunities to educate and upskill as well as provide employable skills training to the local and wider communities. Reflecting this, the development will create a new primary school to meet the needs of the development and others within the vicinity of the site.

Life cycle analysis.

The Applicant will consider the benefit of conducting life cycle costing to inform the procurement and construction process. This could help inform design to maximise value and cost-benefit.

7. Human Capital.

7.1 Purpose.

Understanding of the impact of the built environment on the health and wellbeing of occupants is increasingly well documented and people now expect to live and work in an environment that facilitates high levels of mental and physical wellbeing.

Strategies which embed health and wellbeing at the earliest stages of design ensure the most robust, reliable, and sustainable outcomes.

7.2 Objectives.

13 Put physical and mental wellbeing at the core.

The Proposed Development recognises that people are more than their objective needs. Therefore, the Proposed Development will seek to optimise occupants' mental and physical wellbeing by providing high quality green and amenity spaces and a variety of leisure facilities. These amenities are for future and existing communities to enjoy as space for socialising, exercising, and relaxing.

14 Create healthy and active places to live, work and play.

The design of the Proposed should be as human-centric as possible, maximising occupant comfort and health, and ensuring a safe and secure environment to live, work and play. Active design principles encouraging an active population will be at the heart of the urban design.

15 Improving health without compromising on comfortability.

The Southern Consortium are committed to building a community that is happy, healthy, safe and comfortable. Therefore, the Proposed Development will ensure that design elements and features which address issues with indoor air quality, acoustic performance, daylighting and security are considered at the outset and incorporated within the reserved matters submission.

16 Inclusive design enabling accessibility for all.

By embedding the principles of inclusive design, the Proposed Development is designed to allow people of all ages and abilities to thrive and succeed.

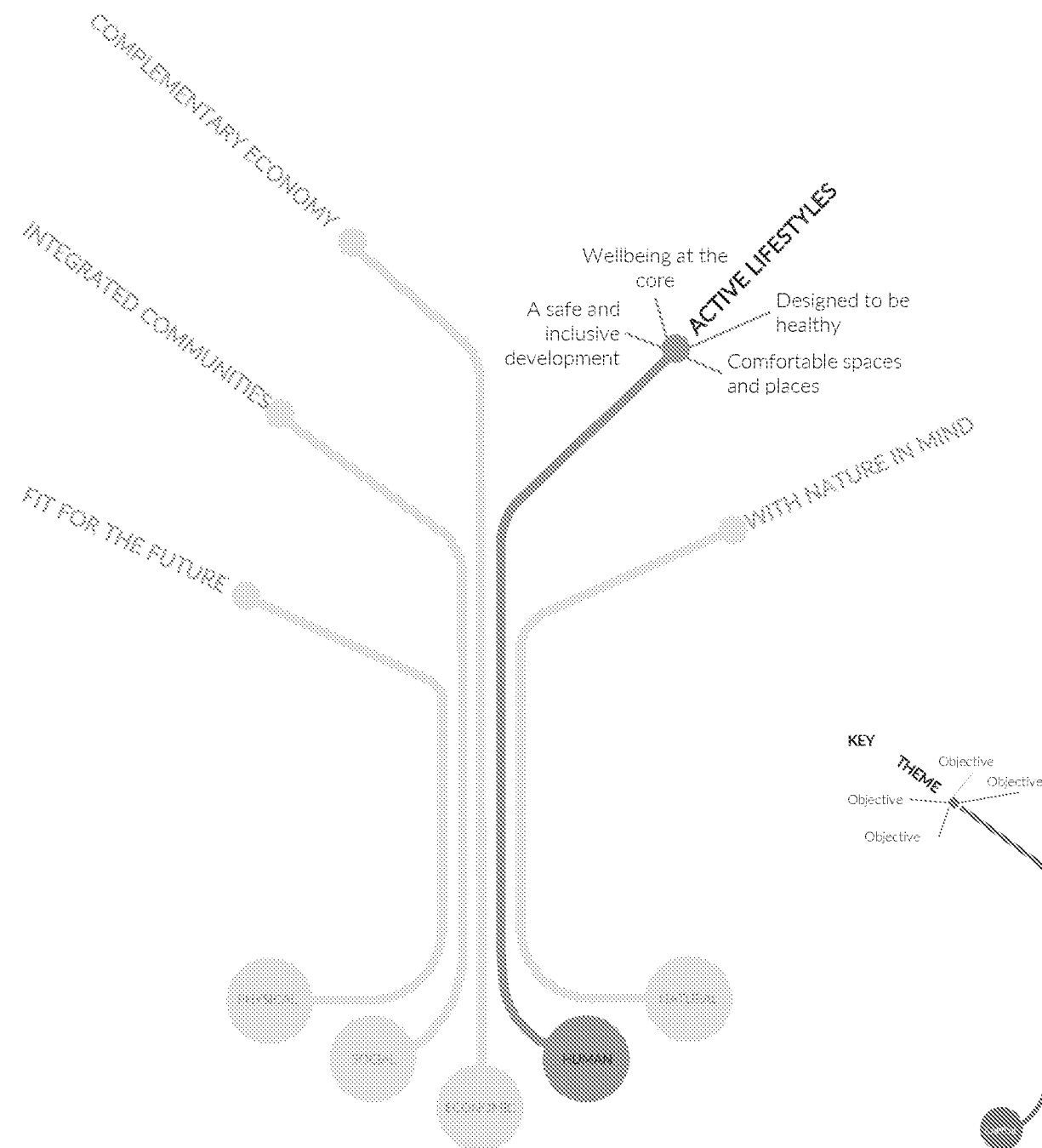


Figure 14: Human capital objectives.

7.3 Measures being explored.



Health and wellbeing

Local policies: Arun Local Plan HWB SP1, QE DM1-DM3; Arun District Design Guide K.06, K.05

Factors affecting physical health are more predictable and can be addressed using established principles of good design. Those affecting mental wellbeing are more nuanced, but by ensuring that the development provides a diverse range of opportunities within an environment which is comfortable and facilitates social cohesion, the Proposed Development will cultivate self-worth and confidence.

The promotion of physical activity, active living and maintaining good mental and physical health are central to the idea of cultivating human capital. Research shows that regular physical activity not only improves fitness but can also have a profound positive impact on health and well-being including reduced risk of chronic diseases such as cardiovascular disease and type 2 diabetes, and better mental health and well-being [1] [2].



Environmental factors

Air quality is a critical determinant of health and poor ambient air quality is the number one cause of premature mortality worldwide [3]. In the U.K. long-term exposure to air pollution contributes to between 28,000 and 36,000 deaths per year [4]. By using the national environmental impact assessment methodology, the development can ensure that significant negative impacts on local external air quality are mitigated.



The Proposed Development will be implementing a sustainably focused energy and transport strategy that seeks to eliminate the risk of poorer air and noise quality as a result of the development's building and transport emission and noise generation. Furthermore, the presence of major roads near the site has the propensity to be problematic from both an air quality and noise perspective.

The energy and transport strategies include measures for low/zero emission heating systems, encouraging a shift to active modes of travel and facilitating a transition to electric vehicles.

Other environmental factors affect the experience of public areas. Local microclimate, including wind, solar radiation, noise, and local thermal comfort could be considered when designing key public areas such as the neighbourhood core. Overheating within homes and buildings is a key consideration in a warming climate and the need to decarbonise will not come at the expense of providing comfortable buildings.

2020 has brought to the fore a new threat – that of a fast-moving global pandemic which has the potential to upturn conventional lifestyles. During this year, people have been made acutely aware of the quality of their home environments, their access to green space, and the availability of local facilities and amenities. The Proposed Development has centred on access to high quality green space and amenities which facilitate a level of self-sufficiency since prior to the pandemic but will continue to respond and adapt to be ready for an unpredictable future.

Thermal comfort

It is widely accepted across the industry that thermal comfort and overheating are key considerations in the design process, as a result of the drive for energy efficiency and increased prevalence of hot periods. The latter can be particularly exacerbated in urban, peri-urban and suburban environments where the Urban Heat Island (UHI) effect occurs.

The cooling hierarchy could be considered, seeking to minimise the need for active cooling as far as possible. During detailed design, the design team will explore opportunities to carry out an overheating risk assessment using a recognised methodology, to inform the mitigation strategy. Even spaces with active cooling proposed could seek to minimise the risk of overheating through passive measures as far as possible.

Thermal comfort contributes significantly to an individual's perception of the quality of a space. However, it can vary depending on the amount of clothing people wear in different situations, and the extent to which a person is active. The Proposed Development will ensure that the thermal indoor environment of their buildings are fitting for the use type and activity of that space to allow the highest level of comfortability and efficiency to the space users.



Air quality

The Proposed Development aims to implement an effective air quality strategy that addresses air pollution present during construction and during operation.

The emerging energy strategy will explore routes to achieving zero carbon by providing efficient systems that are low and zero carbon to minimise carbon emissions as far as possible. In addition to this, it is recognised that internal combustion engines (ICE) in cars and other vehicles are also responsible for a significant proportion of emissions both locally and nationally, and as such the design aims to minimise the use of private cars, encouraging walking and cycling and facilitate the switch to electric vehicles through provision of charging infrastructure.

The following best practice dust suppression measures will be carried out during the construction phase to minimise detrimental impacts on construction workers and local residents. These mitigation measures will be integrated into the Construction Environmental Management Plan (CEMP).

- Water spraying at dust generating work faces.
- Dampening and covering of exposed stockpiles;
- Material storage locations which are mindful of prevailing winds;
- Wheel cleaning facilities to be incorporated, maintained and used;
- Appropriate sheeting of lorries leaving the Site;
- No unauthorised burning on-Site.

In tandem to mitigating the impacts of construction and operation on external air quality, indoor air quality is also of paramount importance to the health and wellbeing of occupants and visitors. It has been shown that good indoor air quality can lead to increases in productivity of up to 11%. As such, the Southern Consortium could encourage housebuilders and the developers of the commercial buildings to explore targeting best practice limits for indoor air quality, implementing and reporting on these measures through an indoor air quality plan.

Daylight

Good lighting is critical to health and wellbeing and occupant satisfaction. The need for and benefit of daylight varies by end use. Where feasible and beneficial, the design of buildings could seek to achieve good practice daylight levels whilst also considering the impacts of excessive daylight exposure i.e. glare. Encouraging housebuilders and developers to conduct daylight analysis to determine the Average Daylight Factors (ADF) and Annual Sunlight Exposure (ASE) metrics could be explored to quantify the daylight access as the design of the buildings progresses.



Noise

Unwanted noise can at best be a nuisance, but at worst can cause longer term health issues.

Acoustic design and noise control are another key element for the design of stress-free restorative environments. Noise has been shown to elevate blood pressure and stress hormones in children.

Noise could also arise from the operation of construction plant and from vehicle movements to and from the Site. All works will be undertaken using Best Practicable Means as defined in the Control of Pollution Act 1974. Works are planned to only occur during the daytime hours, avoiding the potential to disturb residents during most sensitive periods of the night. Measures to control noise and vibration during construction works will be incorporated into the proposed CEMPs for the Development and include the following measures:

- Noisy plant or equipment shall be situated as far as possible from noise sensitive buildings. Barriers (e.g. site huts, acoustic sheds, or partitions) to mitigate noise affecting sensitive buildings will be employed where practicable
- Plant shall be maintained in a good and workmanlike condition so that extraneous noise from mechanical vibration, creaking and squeaking is reduced to a minimum.
- Vehicles and plant used for the purpose of the works shall be fitted with effective exhaust silencers, maintained in good and efficient working order and be operated in such a manner as to minimise noise emissions.

- Equipment powered by mains electricity shall be used in preference to equipment powered by internal combustion engine or locally generated electricity, where practicable.
- Care should be taken to reduce impact noise when loading or unloading vehicles, scaffolding or moving materials, etc.
- Loading of materials into lorries in designated areas only
- Switching off engines of site and delivery vehicles when not in use
- Deliveries to be spread throughout the day avoiding peak hours



Safety and security

The safety of residents, employees, and other visitors to the site is of paramount importance and masterplan design can heavily influence both their objective and perceived security. Good practice principles, embedding security in design, could be explored and employed as far as possible. This could include consideration of lighting, surveillance, access and other design aspects influencing development-wide security as well as a permanent on-site representative to respond to residents' security concerns. Consideration could also be given to industry-recognised guidance such as Secured by Design.

Through consultation with a security advisor, a review of the local security risks pertinent to the Site as well as the impact of the Proposed Development on the neighbourhood, could inform a suite of bespoke security measures to be embedded within the urban design of the Proposed Development.



Construction/phasing

If not managed sensitively, construction can be a disruptive time for both the local community and new residents as latter phases are built. By ensuring best practice construction methods, the Southern Consortium will foster a culture of safety and action to address key issues which may arise, including environmental impacts and social nuisance.

The Proposed Development is expected to be built out in self-contained plots to allow partial occupation, as buildings are constructed. The likely phasing of the Proposed Development is summarised below.

Phase 1 (2023 – 2030):

- A total of 920 new homes will be delivered, (assuming 60 bed care homes delivered in Phase 1), together with the construction of A29 'Barnham connection' (south of Barnham Road to roundabout) and easterly connection to Barnham station of east-west link Barnham station car parking. In addition, the green link, a new primary school together with early years facilities and a community centre will also be delivered within Phase 1.

Phase 2 (2030 – 2033):

- A total of 330 new homes together with part of the linear park that will ultimately cross the entire Strategic Allocation from north to south, the cricket pitch and the westerly connection of East West link will be delivered in Phase 2.

Phase 3 (2031-2033)

- The remainder of A29 south of the railway line and the Hanbury Spur will also be delivered between 2031 and 2033 as part of Phase 3.

The intention is to ensure residential and construction accesses are segregated throughout the development programme, minimising the impact of the construction processes and road movements on local residents.

Post occupancy evaluation

Building a sustainable development is not finished when construction is complete, and ongoing support and monitoring helps to ensure the design intent is realised. Post Occupancy Evaluation (POE) methodologies could be considered to determine that the buildings of the Proposed Development are operating as per the design intent and in line with visitor and occupant expectations.

Inclusive design

Local policies: Arun District Design Guide K.06, F.01, H.03

Inclusive design aims to remove barriers that create undue effort and separation. These are design principles offer new insights into the way we interact with the built environment and creates new opportunities that enables everyone to participate equally, confidently, and independently in everyday activities.

By designing and managing the built environment inclusively, everyone including disabled people, older people and families with small children can reap the benefit of good design. The Commission for Architecture and the Built Environments (CABE) inclusive design principles could be considered and incorporated as far as possible in the design of all buildings and the spaces in between. The Proposed Development could seek to incorporate the following measures:

- Suitable means of access for all people from the entrance points.
- Sufficiently wide routes allowing people to pass each other with a minimum of level changes.
- Principal entrances and lobbies that are identifiable and accessible.
- Independent horizontal and vertical movement that is convenient and ensures that people can make use of all relevant facilities, not only as spectators but also as participants and/or staff.
- New neighbourhoods will include traffic calming measures and careful design of vehicular routes to ensure a pedestrian and cycle friendly environment.

The approach could explore designing beyond the minimum standards set out in the building regulations where possible, taking into account all recognised good practice guidance.



Active and healthy population

By encouraging people to walk and cycle, exploring opportunities to incorporate fitness facilities and incorporating a variety of areas for children and young adults to play, the local population are facilitated to be physically active. Sport England's '10 Principles of Active Design' reflect the importance of embedding an active lifestyle at the heart of placemaking and masterplan design and provide guidance on how most effectively to achieve this; the emerging design of the Proposed Development has and will continue to embed these principles as far as possible.

The emerging masterplan seeks to provide dynamic and exciting play spaces which will be distributed across the site as shown in



Figure 15. Within the Lidsey Rife Linear park, a cricket pitch will be provided with associated 'pavilion building'. Across the site, there will be a diverse array of play spaces in the form of LAPs,

LEAP, NEAP, etc and these will enable a diversity of experiences which encourage exploration and discovery of nature. The play areas will be accessible for children of all ages and abilities to share and enjoy, thus creating a safe space for children to socially interact with each other and be physically active. Spaces for all nature of activity will be available, quiet spaces for relaxation and social and open spaces for group activities

In addition to the provision for play and recreation, the masterplan also includes a wellness trail which circumnavigates the site as shown in



Figure 15. The wellness trail is a jogging or walking trail that also serves as an ecological fringe that integrates with the network of green spaces and green links. The route has been designed to maximise users time exposure to nature by mapping the trails to pass through scenic parklands and open green spaces.

- Planning Application Boundary
- ROAD INFRASTRUCTURE**
- A29 Strategic Road Corridor (refer to detailed highways drawings)
- Approved WSDC A29 Scheme (WSDC/052/20)
- East-West Link Road
- Secondary Road (Indicative parcel access route, exact alignment to be confirmed at detailed design stage)
- Indicative Locations of Vehicular Connections Across Open Space
- Potential Expansion Area for St Philip Howard Catholic School
- GREEN INFRASTRUCTURE**
- Indicative Location of Cricket Pitch (Including a small scale pavilion and car park)
- Open Space Infrastructure (Including Lidsey Rife Linear Park, informal open space, wildlife habitats, wetland areas, meadow land, wet woodlands, vegetation/planted areas, retained trees, play areas, water bodies, drainage features, footpaths/cycleways, walking and occasional vehicular connections)
- Indicative Location of Open Space Provision
- ★ Indicative Location of LAP



Figure 15: Extract of landscape and green infrastructure parameter plans. Source: JTP.



Green space

The benefits of access to green space are well founded and many desires to live within and near to quality green infrastructure. The co-benefits of high-quality green and blue infrastructure are vast. It helps to mitigate flood risk, improves air quality and provides habitat for wildlife. Green space is most effective when it forms part of an integrated community and ecology strategy.

There is a clear hierarchy of open space types within the application site with the Lidsey Rife Linear Park as the primary structural form, supported by the Green Link and Green Corridors. These three landscape features represent a significant and unique amenity gain for the three villages as they serve to enhance the natural asset of the location and create new opportunities for transitional habitats. Although they share key functions, such as drainage attenuation, ecology, and amenity, each has a ‘specialism’. In this way they create a dynamic, varied and changing parkland landscape.

The Lidsey Rife Park is a significant hydrological and ecological feature within the site. It will promote ecological enhancement, balanced with the promotion of recreation and leisure. This amenity space will be accessible to new and existing residents, providing a space for individual and group recreation opportunities.

The Green Link plays a key role in the wider green infrastructure and connectivity of the development. It provides a connection between the Lidsey Rife Linear Park and surrounding play areas. The green corridors constitute the ‘capillary network’, taking residents from their front door to the Green Link or the Lidsey Rife Linear Park, or any civic destinations such as schools or local amenities.

The Green Corridors represent both ‘nature at one’s doorstep’ and the ‘active landscape’ and form the start or end of the journey home. They therefore comprise more intimate informal space for the immediate community.

The improved access to nature will ensure that the health and wellbeing of existing and future residents within BEW are protected. Access to nature has been found to help improve sleep, reduce stress and increase happiness. This in turn has positive effects on psychological conditions such as depression and anxiety. Beyond this, the additional vegetation will improve people’s physical health by absorbing airborne particulates and other pollutants and also create a barrier against noise pollution which causes stress and sleep disturbance.

8. Natural Capital.

8.1 Purpose.

Green and blue space is invaluable and is key to delivering sustainability across all five capitals. Well designed and managed green infrastructure can provide habitats for wildlife and support biodiverse ecosystems. It can provide spaces to exercise, socialise, and learn, facilitating people to be healthy, well, and happy. It can improve air quality and reduce flood risk, whilst sequestering carbon emissions, mitigating some of a development's contribution to climate change. People have affinity with green and blue space and if done well, the pride in place it stimulates can be felt in generations long after a development is first built. With a greenfield site, the importance of mitigating any prospective development's impact on the natural environment is paramount.

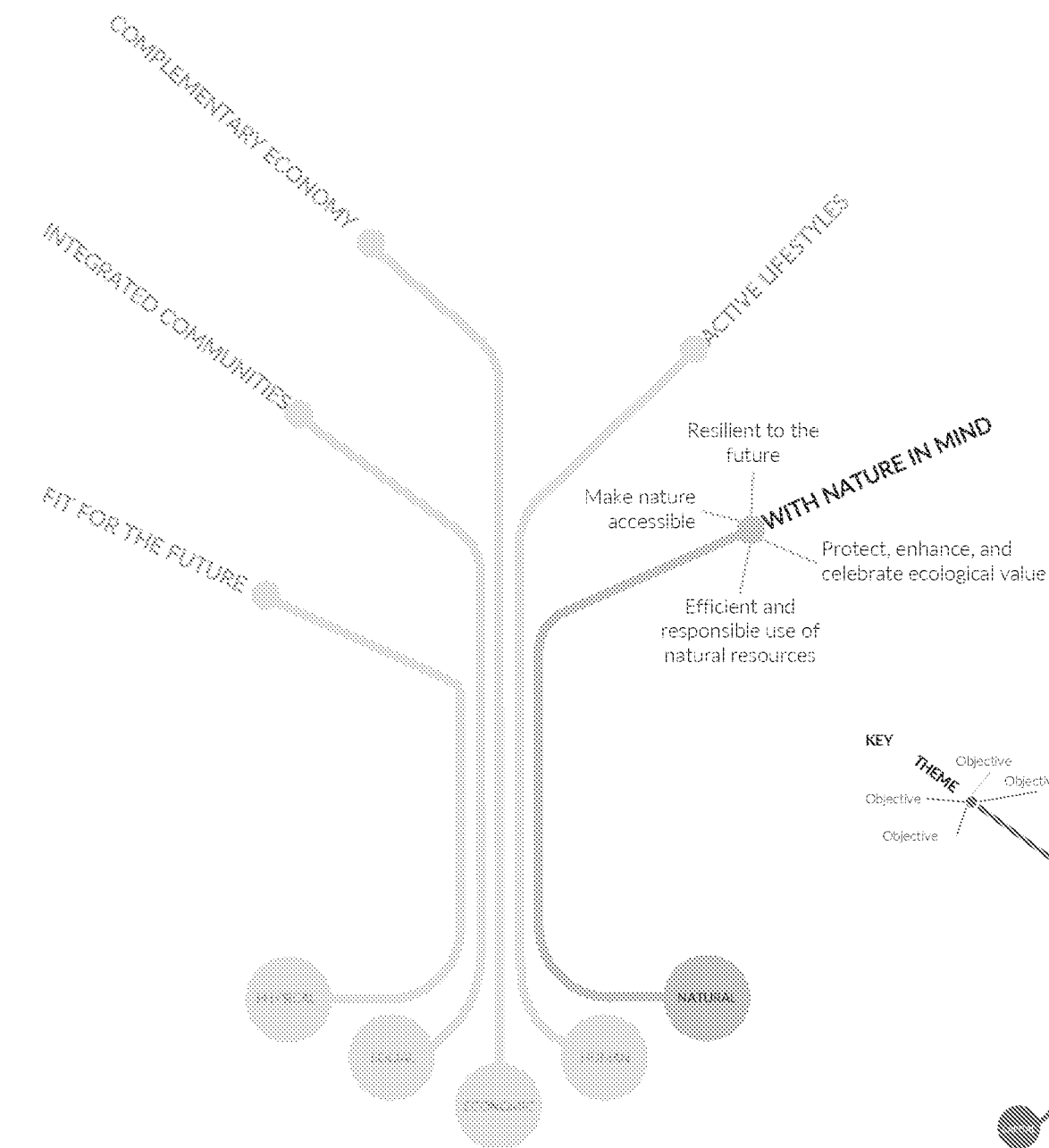


Figure 16: Natural capital objectives.

8.2 Objectives.

17 Create a network of varied and connected habitats which celebrate nature and achieve a net gain in biodiversity.

The Proposed Development seeks to ensure that existing habitats are protected, and new networks of varied and connected habitats are incorporated to ensure that the Site develops a net increase in ecological value. The Proposed Development will ensure that urban design does not compromise the natural environment but celebrates it across the development for the benefit of people and wildlife.

18 Efficient use of natural resources by employing the principles of circular economy.

The design of the Proposed Development would be underpinned by principles of resource efficiency, seeking to minimise the consumption of water, use of materials, and the generation of carbon and waste throughout the lifecycle.

19 Convenient and inviting linkages through landscape brings people closer to nature.

By considering how the development interacts with the surrounding environment, the Proposed Development's illustrative masterplan includes enhanced and improved accessibility to green spaces by extending fingers of landscape through the streets. All homes are within close walking distance of a dedicated green space.

20 Ensure resilience in a changing world.

As the Proposed Development is delivered, consideration will be given to the need for adaptability and flexibility in designs, ensuring resilience to a changing climate, ready for dryer, hotter summers and wetter winters prone to more extreme weather events. It would also be ready for changing technologies and lifestyles, ensuring it is a place that adapts, not conflicts, with an evolving society.

8.3 Measures being explored.



Ecology and biodiversity

Local policies: Arun Local Plan ENV DM5; Arun District Design Guide E.02, E.03

We are in the midst of a biodiversity crisis [5], with species threatened at global and national level. In response, sustainable development must build with nature, considering how coordinated design approaches can integrate features of ecological value to the benefit of both the natural environment and the people who dwell within it.

Defra recognises this importance and the significant impact prolific urbanisation is having on the UK's ecosystems, mandating that all new development achieve a net gain in biodiversity of at least 10% in the forthcoming Environment Bill [5].

Protection and preservation of existing habitat

At present, the vast majority of the development site comprises of habitat of negligible ecological value in the form of arable land. The habitat surveys conducted on site confirms the following habitats that are of greater value in the context of the site and which will be retained as part of the proposals.

- A number of scattered trees are located throughout the site all of which will be retained within the Lidsey Rife Linear Park. These trees are considered to be well buffered from the development during the construction period such that no effects are considered.
- All ponds with the exception of the reservoir will be retained. The reservoir will be removed to facilitate the development of the new A29 link road and is considered to be ecologically insignificant as there is no aquatic or vegetation present in the feature.
- The Lidsey Rife stream will be retained and enhanced as part of the development proposals within the Lidsey Rife Linear Park. As such, there will be no losses to this feature as part of the proposals. A clear-span bridge across the stream will be utilised to minimise habitat loss as well as disruption to the wildlife corridor beneath the bridge.

The site supports a number of notable and protected species including bats, badgers, water voles, birds and reptiles. The most favoured habitats utilised by bats and water voles is the Lidsey Rife stream which will be fully retained and enhanced as part of the proposal, therefore there will be minor to insignificant losses of habitat to these species. Bird activity was detected to be largely confined to the hedgerows, treelines and stream habitat within the site; the majority of these habitats will be protected during construction. As such, the vast majority of key bird habitat will be retained as part of the development proposals.

The three reptile populations detected on site, Common Lizard, Slow-worm and Grass snake will be protected by ensuring any works to be undertaken in the vicinity of key reptile habitat will be done so under the supervision of an ecologist. The reptile populations will be translocated to a suitable receptor location adjacent to the Lidsey Rife stream (The Lidsey Rife Linear Park). The retention and buffering of key habitats and wildlife corridors, with complementary habitat creation, will protect and enhance opportunities for these species.

Construction methods of best practice have been proposed throughout the Ecology chapter within the Environmental Statement in order to alleviate any potential adverse impacts on retained habitats. This includes appropriate storage and containment of potential hazardous substances, use of protective fencing and awareness of sensitive areas and potential routes of contamination.

Most importantly, all existing habitat which is retained could be brought into the management regime of the site, ensuring its long-term health as well as ensuring availability of footpaths and accesses to allow the local community to benefit from and connect with nature.

Habitat creation

Avoiding fragmentation of existing habitat and creating habitat to connect existing areas of natural value and create an integrated network of good quality green and blue infrastructure allows both people and wildlife to thrive.

With the inclusion of the new Lidsey Rife Linear Park and the large area of open space located in the west of the site, the Proposed Development will deliver a significant enhancement in terms of habitats. The Lidsey Rife Linear Park which will buffer the stream from the remaining development, will include habitats such as wildflower grassland, new shrub and tree planting and a large number of new ponds, with the planting mixture based around the use of native and wildlife-beneficial species. This is anticipated to fully offset any biodiversity losses and considered in light of future management, will represent a net gain in biodiversity terms relative to the existing situation.

The significant addition of species-rich wildflower grassland, bolster planting (hedgerows), new tree and shrub planting, and a large number of new ponds will provide a much greater foraging potential than currently present for badgers, water voles, birds and reptiles species. In addition, a large number of bat boxes will also be erected at various locations within the site, providing new roosting opportunities for this group. A number of Hibernacula will also be installed within the Lidsey Rife Linear Park and again will further contribute to the significant enhancement over the existing situation.

Many of these habitats are susceptible to visitor pressure effects such as increased erosion due to concentrated heavy footfall and nutrient enrichment from accumulation of dog faeces. The following are some early pre-mitigation measures to be included to protect habitats from impacts of human habitation during operation.

- Reduce artificial light spill as far as possible in the vicinity of green spaces, hedgerows, and landscape buffers to protect local bat population.
- New woodland areas, hedgerows and residential gardens will provide an increased habitat resource for nesting birds, breeding birds and winter birds which would be significantly impacted by cat predation.
- Additional habitat for badger, in the form of woodland, scrub and grassland areas will be provided.

Overall, the developer is committed to achieving the Defra net gain in biodiversity which is 10% in line with the Environment Bill and planning policy requirements. The site and, if necessary, the wider estate, have sufficient flexibility and capacity to ensure this is the case based on preliminary calculations of the concept proposals.



Climate change mitigation and adaptation

Appropriately at the forefront of recent discussions at both global- and national-scale, humans' contribution to climate change and the consequences for the people of Earth is a primary consideration for any new development. With the built environment contributing around 40% of the UK's greenhouse gas emissions [6], and 80% of the buildings which will exist in 2050 already built, new development must go further than ever before if we are to reduce our national carbon emissions to net zero by 2050 in line with our legally binding obligation.

Operational and embodied emissions

Opportunities to minimise the operational emissions could be maximised and the energy strategy will ensure low carbon operation on day 1, with a demonstrable route to zero carbon in future.

Embodied carbon is a more complex problem to address and the science to do so is less mature. However, opportunities to harness innovative construction methods and low carbon materials could be explored and encouraged at the plot level.

Trees planted on the site, as well as existing woodland, will sequester carbon, helping to offset the impact of the development. This is something that could be calculated and monitored to understand the magnitude of the benefit.

Overheating

A warming climate means warming homes and the risk of summer overheating is exacerbated in thermally efficient new homes if not considered properly. Mitigating the risk of overheating while maintaining good thermal performance will be a key objective of the building-level design. Homes could be designed and assessed against CIBSE TM59 criteria to ensure that overheating risks are considered and mitigated against.

Extreme weather events

Climate change is known to be increasing the frequency of extreme weather events. Design and materials specification will respond to the local risk and provide resilient and robust buildings and infrastructure.



Water efficiency
Relevant policies: K.02

Water is in increasingly short supply; a problem that is set only to exacerbate as a consequence of climate change, with concerns that we will not have enough water to supply our needs within 25 years if drastic action is not taken to reduce water consumption. Even today, being water efficient is key to minimising the Proposed Development's footprint holistically. Furthermore, the energy associated with creating and transporting potable water is not insignificant.

By minimising water consumption, the Proposed Development could be resilient to and further mitigate its contribution towards a warming climate. Opportunities for reducing demand for potable water, such as low flow fixtures and fittings, leak detection and flow control devices, could be explored and encouraged at the building-level.



Flood risk
Local policies: Arun Local Plan W DM3; Arun District Design Guide E.01, K.04

A flood risk assessment undertaken on the site confirms the following risk of flooding towards the Proposed Development.

Table 2: Flood risk results. Source: Pell Frischmann.

Sources of Flood Risk	Degree of Risk			Comments
	Significant	Moderate	Low	
Fluvial		×		The Site is in Flood Zone 1, however, several small Watercourses and the Lidsey Rife have floodplain associated with them
Coastal & Tidal			×	The site is within a few miles of the coast, but the extent of tidal inundation is limited to the Lidsey Rife corridor.
Groundwater	×			Susceptibility to groundwater flooding due to shallow groundwater levels
Surface water			×	Isolated areas of surface water risk centred around ditches.
Sewers		×		Limited extent of sewers on site but site visit investigations show evidence of foul water surcharge.
Canals			×	None in the vicinity.
Waterbodies			×	One present in the south, heavily impounded, but risk remains low

Sustainable drainage

Sustainable Drainage Systems (SuDS) aim to mimic the natural runoff regime and minimise any detriment to the wider water environment. In keeping with the 4 pillars of SuDS design, using a range of features can provide a variety of benefits, from managing water quantity and quality, to improving biodiversity and local amenity value.

The primary nature of attenuation SuDS features implemented on site are that of dry, grassed basins which fill up when storm events occur but do not have a permanent body of water. These basins provide suitable storage capacity, treat the water by naturally filtering out contaminants, provide a pleasant green landscape when not attenuating runoff and enhance biodiversity through wildflower planting and the associated habitats that offers.

In addition to the dry basins, and in the interest of ecological benefit and landscaping opportunities, some of the basins are to be designed with a permanent body of water as indicatively shown in Figure 17.

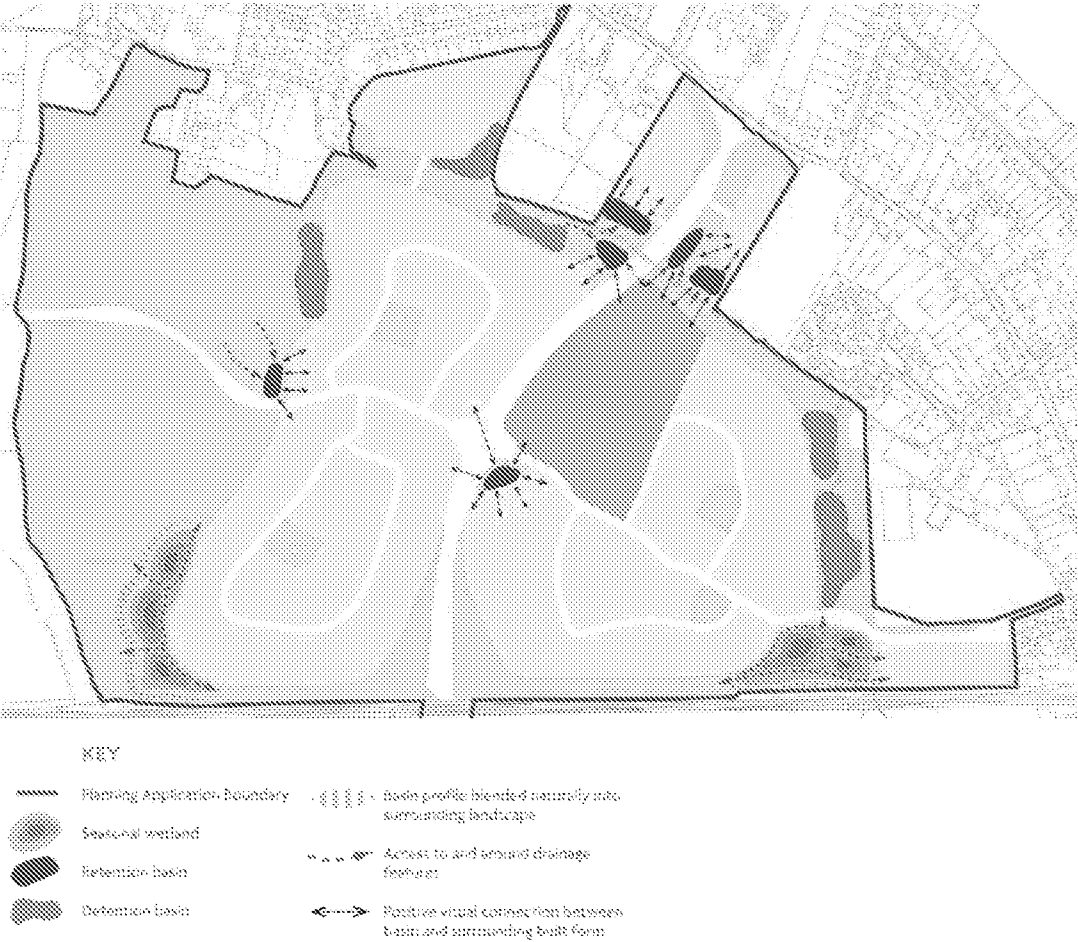


Figure 17: Sustainable urban drainage features. Source: JTP.

Drainage report confirms that additional SuDS features such as the following are recommended additional measures to include at detail design to promote rainwater capture and additional levels of treatment to surface water runoff.

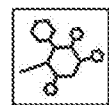
- Water butts
- Rainwater harvesting systems
- Permeable paving
- Filter drains
- Swales
- Rain gardens
- Tree Pits

Create valuable, accessible, and educational green and blue infrastructure

Whilst providing a diverse range of green and blue space demonstrates clear ecological benefits, its value stretches much further. It helps to minimise surface water run-off and provides attenuation in extreme weather events, making a development more resilient to flooding.

Further to this, access to green space has been shown to have significant benefits to both physical health and mental wellbeing. It improves air quality, reduces noise, and provides an inviting location to socialise. However, public green and blue space is only valuable as long as it is safe, accessible, and inviting, all of which require a robust management regime in order to sustain. As such, robust management regimes and contracts for all green spaces could be sought.

With the design principles and emerging strategy presented in the Human capital, along with a commitment to maintain and sustain, green and blue infrastructure should rightfully become a defining characteristic of the Proposed Development.



Materials

Local policies: Arun District Design Guide L.02, L.03

The environmental impact of materials stretches farther than their embodied carbon. Materials which demonstrate robust environmental credentials and low impact could be sought and encouraged where possible. This will include consideration of the resilience and robustness over their lifetime, including in a changing, more extreme climate. The ability to reuse and recycle materials at the end of their life will also be considered when specifying materials.

The social impact of materials is also a consideration and preference could be shown to those suppliers which demonstrate a socially responsible manufacture and supply chain.

It is recognised that, as energy performance of buildings improves, the proportional impact of the embodied energy and carbon of the construction materials used will become ever greater. To reflect this, the Proposed Development will explore the opportunity for re-use of existing materials on or near to the site.

Procurement of materials used in construction would seek to follow a Sustainable Procurement Plan, which could help to ensure materials are responsibly sourced where feasible to do so. Procurement of materials with environmental product declarations will also be considered and implemented where feasible to do so.

Additionally, opportunities could be explored to source materials locally, reducing the emissions associated with transport materials to Site, whilst also supporting businesses in the local area.

As part of design development, a Life Cycle Assessment (LCA) could be considered to quantify the embodied carbon associated with the Proposed Development. This embodied carbon assessment could be used to inform material selection to ensure that the environmental impact of the Proposed Development is considered not only during the construction and operation stages, but also further up the chain where materials are sourced and manufactured.



Waste

Local policies: Arun Local Plan WM DM1; Arun District Design Guide H.07, K.02



Waste, both from construction and during operation, has significant environmental and social consequences. During construction, the creation, transport, and disposal of waste generates significant carbon emissions. Furthermore, if construction waste is sent to landfill, the materials' life cycle ends; if materials are reused or recycled instead, the energy which would be used to create the virgin materials to fulfil their function are avoided, creating a significant net saving in greenhouse gas emissions.

Creating construction materials is energy intensive, and as buildings in operation become more efficient, the proportion of a building's whole life emissions embodied within the building materials increases. By applying the principle of circular economy to the construction process, maximising the proportion of recycled materials used in construction and minimising the amount of waste sent to landfill, this embodied impact can be reduced.

Minimising the waste generated during a building's operation is more challenging and relies on the behaviour of future building occupiers. However, development design can encourage and facilitate this behaviour as far as feasible by providing appropriate facilities which are easy to use and ensuring occupants receive clear and concise education on the waste services at their disposal.

Minimising waste, both during construction and operation, will form a key part of the future strategy, leveraging the principles of circular economy throughout.

During construction opportunities to utilise as much of the construction, demolition, and excavation material on site as possible could be sought and waste that does leave site will be diverted from landfill as far as is feasible. During operation, residents could be facilitated and encouraged to recycle in line with local policy requirements as a minimum. As part of design development, an operational waste strategy could be developed to provide guidance and establish waste management strategies for implementation during the operational phase and ensure that the bin stores are appropriately sized to accommodate anticipated waste streams.

The operational waste strategy would include consideration of the local waste management infrastructure within the region and be developed to utilise this existing infrastructure as part of the waste disposal routes for the operational phase and facilitate minimal waste sent to landfill.

Ultimately, the Proposed Development will seek to embed the principles of circular economy throughout the lifecycle.



Novel construction approaches and methods

The typical 'bricks-and-mortar' approach to constructing homes and buildings has seen little innovation in the past decades. However, recent applications of manufacturing approaches have the potential to reinvent the construction process.

By manufacturing buildings or building components in a factory environment offsite, the quality, speed of delivery, on site time, and cost can all be improved. By standardising the construction process, material wastage and embodied carbon can also be minimised, and the thermal performance verified prior to installation.

So called modern methods of construction (MMC) could be explored with housebuilder partners and plot-level developers at later design stages.

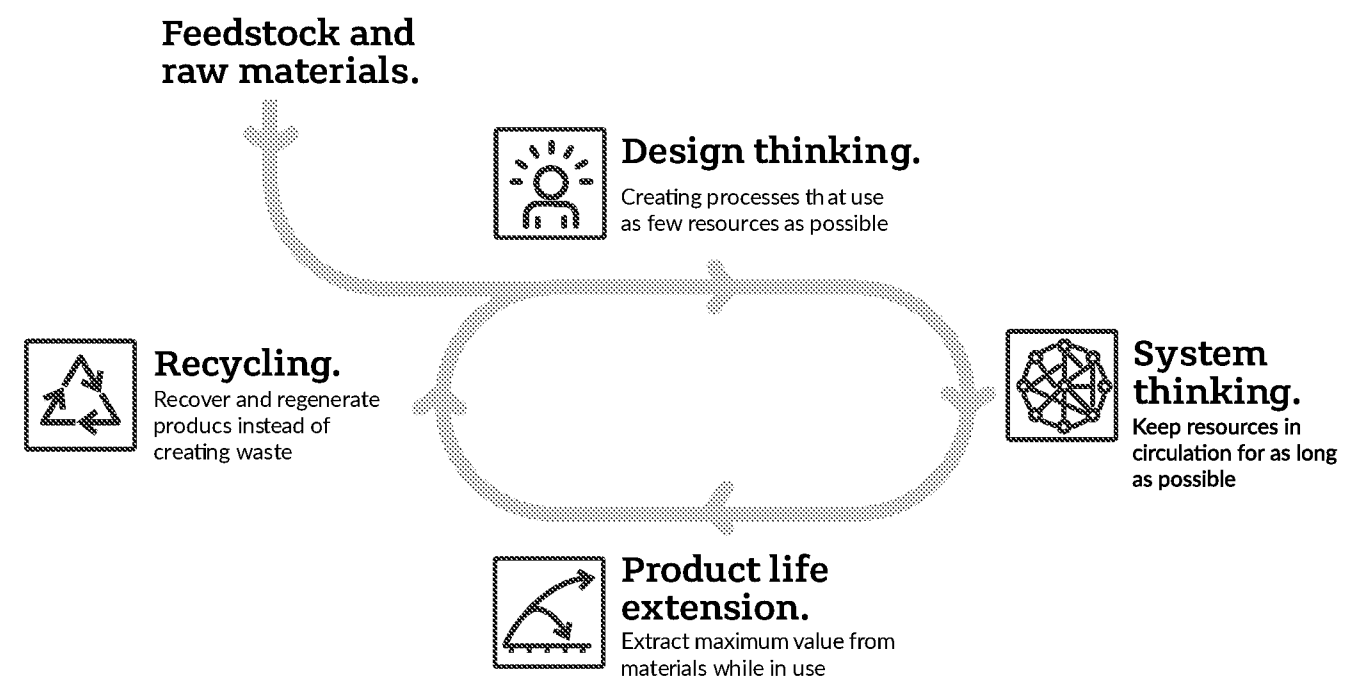


Figure 18: Simplified graphic of the Circular Economy highlighting the key components of the principle of circularity.

9. Conclusions.

The Proposed Development presents a unique opportunity for large-scale strategic development in Arun. In combination with the Southern Consortium's aspirational, people-centric, and environmentally robust approach to masterplan design and development, the Proposed Development has the propensity to be an exemplar development, delivering value for both existing and new communities.

The approach taken will focus on creating value in each of the Five Capitals to deliver sustainability holistically. The emerging proposal considers physical, social, economic, human, and natural issues with commensurate weight, responding to local sensitivities and seeking to go far beyond compliance-led design to create a truly brilliant place.

9.1 Sustainability strategy.

The emerging strategy seeks to respond to the UN Sustainable Development goals and wider challenges of biodiversity, health and wellbeing and climate change. This section provides a brief summary of the measures that are being considered under each of the five Capitals.

Physical



A development is much more than its buildings, but the buildings are the foundation upon which a community is built. The buildings will outlast most people, creating a lasting legacy of which residents who have shaped the community can be proud. The physical infrastructure, and the way in which this is integrated into the existing environment in a commensurate way, is the means by which value creation across the other four capitals is achieved.

Connectivity, permeability and legibility are the core principles guiding the Proposed Development's mobility strategy. The Proposed Development seeks to promote active travel and sustainable mobility by providing a network of well maintained, safe and inviting routes for walking and cycling within the development, with connections integrating with external routes. The Proposed Development encourages utilisation of sustainable and public transportation as far as possible by making it the most convenient option through the provision of safe and direct routes as well as ample provision for cycle parking for residents and visitors

The homes and buildings could be of a high quality, designed to be accessible and inclusive for people of all lifestyles, complemented by a future-proofed and resilient energy strategy – focussed on energy efficiency, demand reduction, and maximising the provision of renewables.

Social



A development is only as strong as its people and communities, and social value is all about opening up opportunities for them to thrive. A successful development seeks to exist not in isolation, but to embed itself within the local community whilst maintaining its own character and identity. A development which facilitates and encourages a cohesive society both within itself and as part of a wider regional community generates pride and longevity.

The Applicants continuous active engagement with stakeholders and local communities demonstrates their genuine interest to engage with the local people about the Site. The Applicant seeks to ensure that everyone is given a voice and feedback and recommendation received are responded to where appropriate such that local people feel they have meaningfully shaped the design of the new development. Opportunities to engage the existing and new community during occupation could be explored, as well as investing in the community, to promote social cohesion and pride in the place.

Key to this will be giving the Proposed Development a distinct identity which celebrates the existing heritage and the history of the wider region.

Ultimately, the design would focus on creating places which bring people together and create a vibrant and welcoming community.

Economic



Realising economic value unlocks value creation across all capitals, enabling positive, sustainable, and equitable growth and prosperity. A successful development seeks to create economic value for the developer and all those who live and work in the development. Providing a varied residential offer to suit a range of budgets and complementary amenities and facilities will help to attract businesses to the local area which will in turn strengthen the local market, encouraging inward reinvestment which allows a development to thrive.

The Proposed Development aspires to create long-term, high-quality, sustainable jobs by providing amenities and facilities focussed on the local community and economy. Recognising the demand for home working in light of the 2020 pandemic, facilities in homes such as digital connectivity would allow people to thrive in the new normal.

During construction, the Proposed Development could explore opportunities for preference to local enterprises and procuring materials within the region as this would help generate economic opportunities for the local area and the region. By seeking to employ trainees and apprentices from the local area, the Proposed Development would create direct, high quality employment via during the construction phase as well as during occupation and operation.

Human



Individual experiences are unique and require an approach to development design which is sensitive to this and recognises the nuance and subjectivity of people's needs. However, there are environmental factors to which we, as humans, universally respond. We know that people are happier and healthier when they feel safe and supported, and their senses and basic requirements have been considered. This human-centric approach is about looking at both individual and collective needs – considering the diversity of human experiences, as well as the factors that bring us together to create a culture of inclusivity and balance.

The Proposed Development could look to ensure a healthy, comfortable, and safe community and implement a strategy with mental wellbeing as a priority outcome. The approach to masterplanning seeks to facilitate an active population and create inclusive streets, homes, and workplaces.

2020 has brought to the fore the risk a global pandemic poses to health and mental wellbeing and the landscape-led approach to the design of the Proposed Development ensures people have plentiful access to high quality green space and the provision of amenities which enable good levels of self-sufficiency, even in times where people are unable to stray far from home.

Wider than this, the Proposed Development seeks to define itself in part by its network of high quality, multi-functional green spaces and the inviting routes between them which facilitate a healthy and active community and provide opportunities for play, recreation, exercise and relaxation for people of all demographics and physical abilities. Central to this is the activity trails across and around the site, proposed to enhance the pedestrian network which will provide varied and dynamic opportunities for play, education and fitness.

Natural



Enhancing the environment is a key responsibility of new development, both within the local context and through contributing to wider climate and biodiversity challenges. The built environment is the most powerful influence on our natural world, and when considering how we add value we have to take a bold and ambitious approach that considers both what we can remove (in terms of negative impact) and what we can add (in terms of transforming an environment for the better). Ultimately, with the right approach, the built environment can exist and enhance our natural world in harmony.

The Proposed Development seeks to create a network of varied, permeable, and connected habitats whilst protecting the priority species present on site; the ultimate goal being to create a net positive gain which

celebrates biodiversity and puts people in touch with nature, complementing the health and wellbeing and social value created.

The Proposed Development could be designed with future climate in mind, appreciating that it is likely to be subject to hotter, dryer summer and wetter winters prone to more extreme weather events. A sustainable drainage strategy, incorporating natural solutions such as wet and dry basins to mimic natural drainage provides resilience to future flooding whilst providing a wealth of ecological, amenity and wellbeing benefits.

The design of buildings and places would look to ensure resilience in a warmer climate, incorporating passive design measures and green and blue infrastructure to create a comfortable microclimate.

The Proposed Development could seek to be resource efficient, both during construction and operation. This would be achieved by exploring solutions to minimise the consumption of water, use of materials, and the generation of carbon and waste throughout the lifecycle, employing the principles of circular economy as far as possible. It could seek to minimise use of virgin materials during construction, whilst an embodied carbon assessment could be considered to inform material selection. Responsibly sourcing materials in line with a sustainable procurement plan could be considered, whilst an operational waste strategy could be developed to inform a sustainable management approach for the operational phase.

Summary

The Proposed Development presents a unique opportunity for large-scale strategic development in Arun. In combination with the Southern Consortium' aspirational, people-centric, and environmentally robust approach to masterplan design and development, The Proposed Development has the propensity to be an exemplar development, delivering value for both existing and new communities.

The approach taken will focus on creating value in each of the Five Capitals to deliver sustainability holistically. The emerging proposal considers physical, social, economic, human, and natural issues with commensurate weight, responding to local sensitivities and seeking to go far beyond compliance-led design to create a truly brilliant place.

“The Proposed Development is designed to be **fit for the future**, stitched into the surroundings to establish **integrated communities**, creating a **complementary economy** which promotes inward investment and placemaking which enables people to be healthy by leading **active lifestyles** and building **with nature in mind**.”

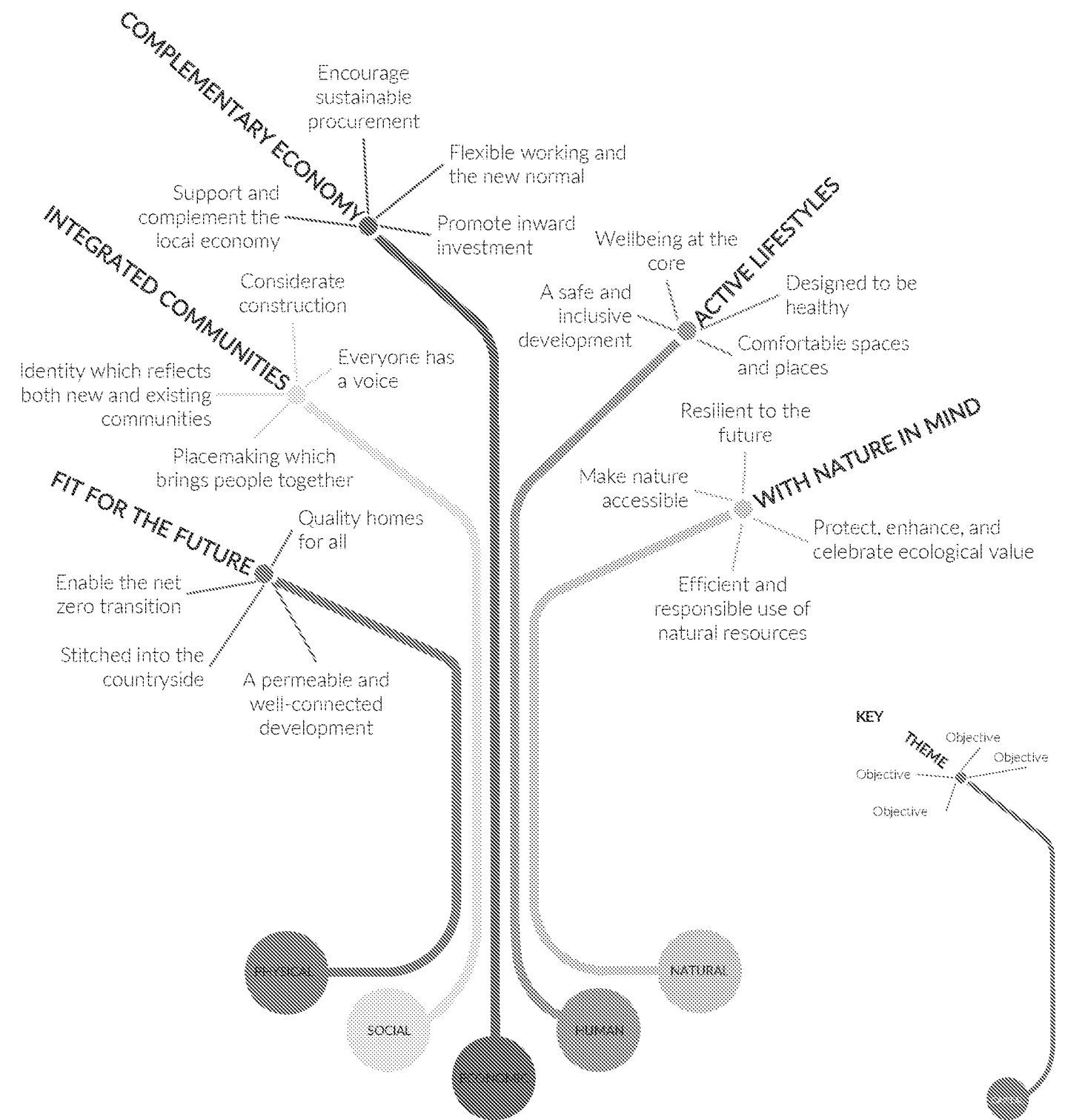


Figure 19: Approach to sustainability for the Proposed Development.

9.2 Energy strategy.

The Southern Consortium's Energy Strategy will identify opportunities to reduce carbon dioxide (CO₂) emissions and optimise energy efficiency within the masterplan. The energy strategy will not form part of the planning application for approval but will be considered at the point of delivery.

This strategy will be developed using a 'fabric first' approach through the Be Lean, Be Clean and Be Green energy hierarchy to maximise reduction in energy through passive design measures in the first instance.

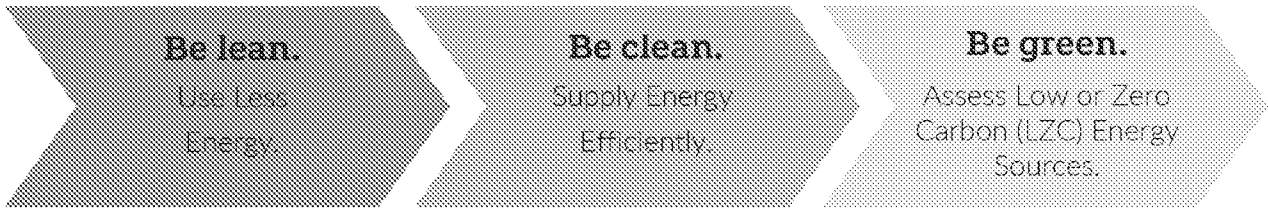


Figure 20: Energy hierarchy.

Be lean – Use less energy.

A form and fabric first approach will maximise efficiency of building layout and form, as well as the thermal performance of the buildings' envelopes. This could be achieved through solutions such as low U-values, air permeability and efficient glazing to minimise heat losses in winter and maximise coolth retention in summer months.

Be clean – Supply energy efficiently.

It is considered that the density of the Proposed Development is not conducive for an effective or efficient deployment of a site wide heat network. However, opportunities to deploy an ambient loop energy sharing network within the local centre could be explored.

With the foresight of the emerging Future Homes Standard which will invoke changes to Part L and Part F of the Building Regulations for new dwellings in 2025, the development recognises that an all-electric servicing strategy as a suitable approach to compliance.

By leveraging the continuing decarbonisation of the national electricity grid, if the Proposed Development pursues an all-electric strategy, it would be low carbon on day 1, reducing to net zero carbon emissions around the mid-2030s.

Electric batteries and other forms of energy storage could be explored to add resilience to the strategy and reduce the carbon emissions, by diversifying energy demand away from peak times and maximising the proportion of any renewably-generated energy which is consumed onsite.

However, the emerging strategy for the Proposed Development will be determined at reserved matters and will respond to energy landscape at the time of submission. 'Locking in' a development to a single strategy or technology in a period of such rapid change in the energy sector would be short-sighted, and the strategy will remain flexible to existing, emerging, and disruptive technologies to deliver the most effective response at the time the homes and buildings are actually delivered.

Be green – Low or zero carbon energy sources.

The strategy will be flexible and respond to the most appropriate technologies present at the time of delivery.

One solution that could be explored is for all homes and buildings to utilise an electric heat pump to meet the heating and hot water demands of the development. Heat pumps allow the extraction of renewable heat from the atmosphere, ground, or water source, with electrical efficiencies of 250% or more. Air and ground source solutions are being explored, along with ambient loop solutions where these present a benefit.

A provision of solar photovoltaic (PV) panels generating zero carbon electricity would complement the strategy and maximising the deployment on buildings and in strategic arrays is to be explored.

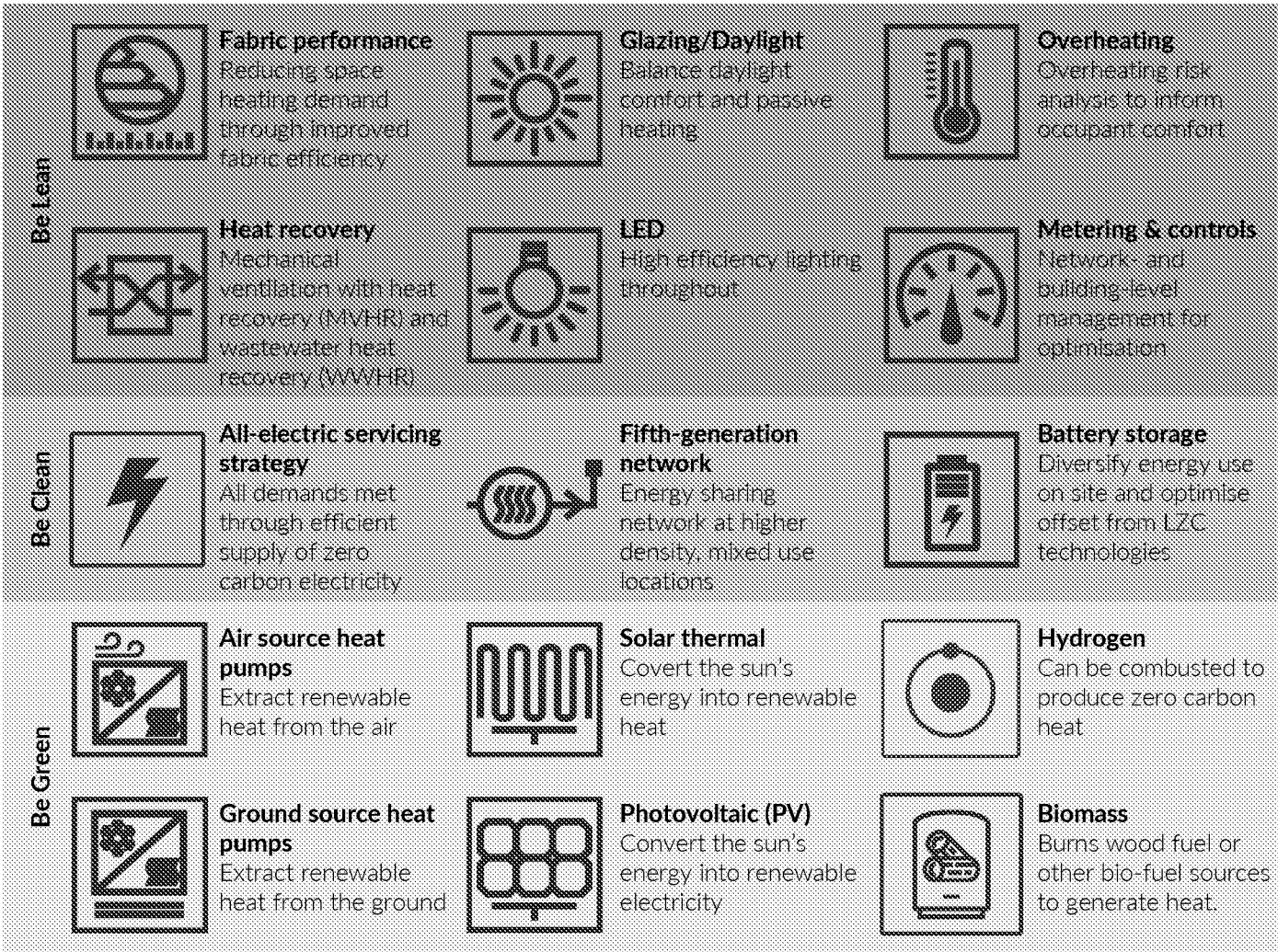


Figure 21: Technology options which could be explored for the Proposed Development masterplan.

Appendix A – Energy strategy.

Site context.

To provide some context of the climate affecting the proposed development site, both in the near future and at the middle of the century, information was extracted from the CIBSE future weather files.

The Design Summer Year (DSY) 1, high emissions scenario, fiftieth percentile weather data for 2020 and 2050 have been used.

Temperature

External temperature is the primary driver dictating heating and cooling loads for a development. Whilst these are predictable and relatively consistent year on year, climate change is having a tangible long-term impact which means that an understanding of the likely future climate is essential to designing an effective development.

Figure 22 shows the anticipated average daily dry-bulb temperatures throughout years 2020 and 2050. It is evident from this that a general warming is seen across the board, with monthly average temperatures rising by ~1.5 in every month: an inevitable result of climate change.

The peak high and low temperatures in 2020 are 34.6°C and -6.8°C respectively. When comparing to the 2050 weather file, the general profile of the graph is very similar, though the peak high temperature is anticipated to rise by 1.8°C to 36.4°C and the peak low by 0.8°C to -6°C.

The trend of increasing temperature indicated here will be an important consideration when ensuring that the Proposed Development is a comfortable place to reside and promotes high levels of occupant health and wellbeing not only now, but throughout the lifetime of the development. With improvements to passive design, ensuring dwellings do not overheat in peak summer weather is an increasing challenge.

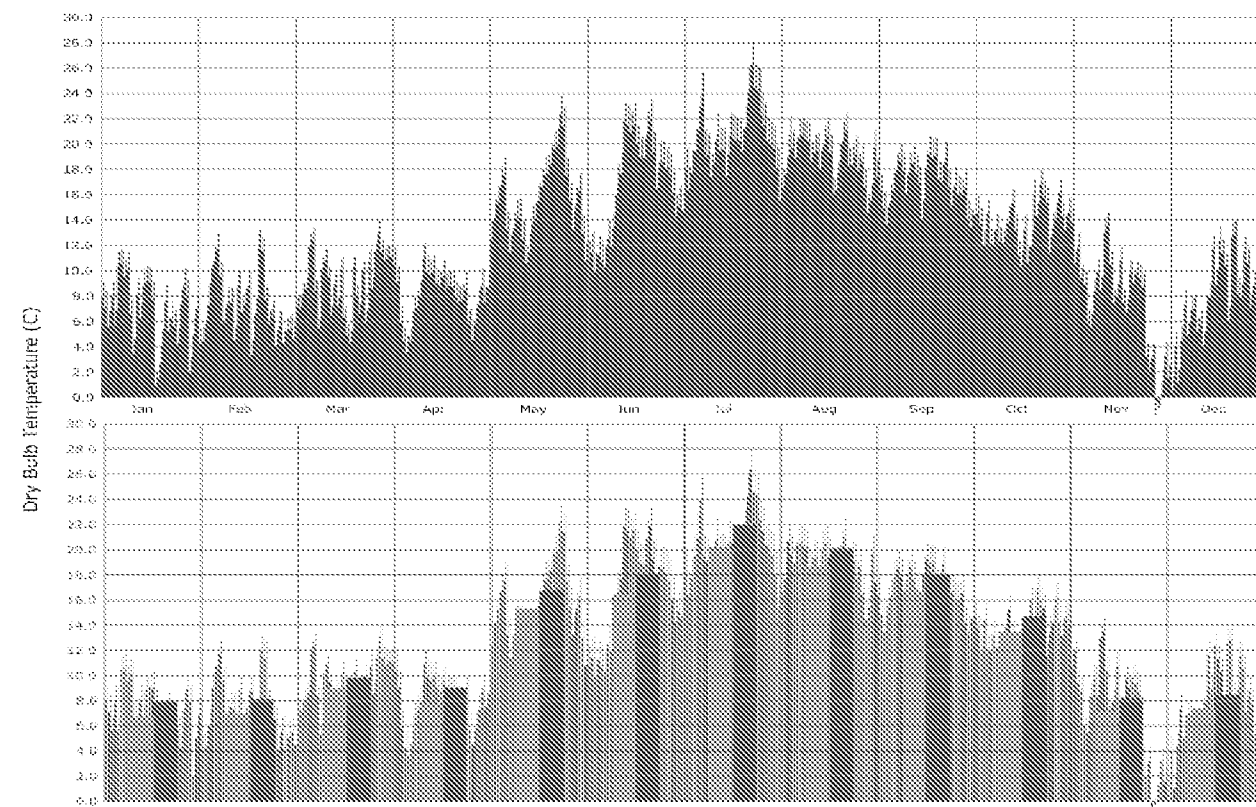


Figure 22: Top – Comparison of the average daily dry-bulb temperatures in years 2020 and 2050. Bottom – The corresponding average monthly temperatures are shown by the coloured bars.

Wind

Wind is important for a number of reasons and poor design can cause wind to have a permanent negative impact on a development: wind's effect on acoustics, the environmental, health and safety, comfort, and building services all need to be considered.

Figure 23 is a wind rose showing the incident direction and speed of wind likely to affect the site in 2020. It is evident from this that wind from south-west and south-south-westerly directions are likely to be most prevalent though average wind speeds in all directions are in the range ~2-4m/s.

The figure also shows a boundary chart of the average wind speeds at various altitudes from ground level to 30m. As is to be expected, wind speed rises steadily as altitude increases: this should be considered throughout the design of taller buildings.

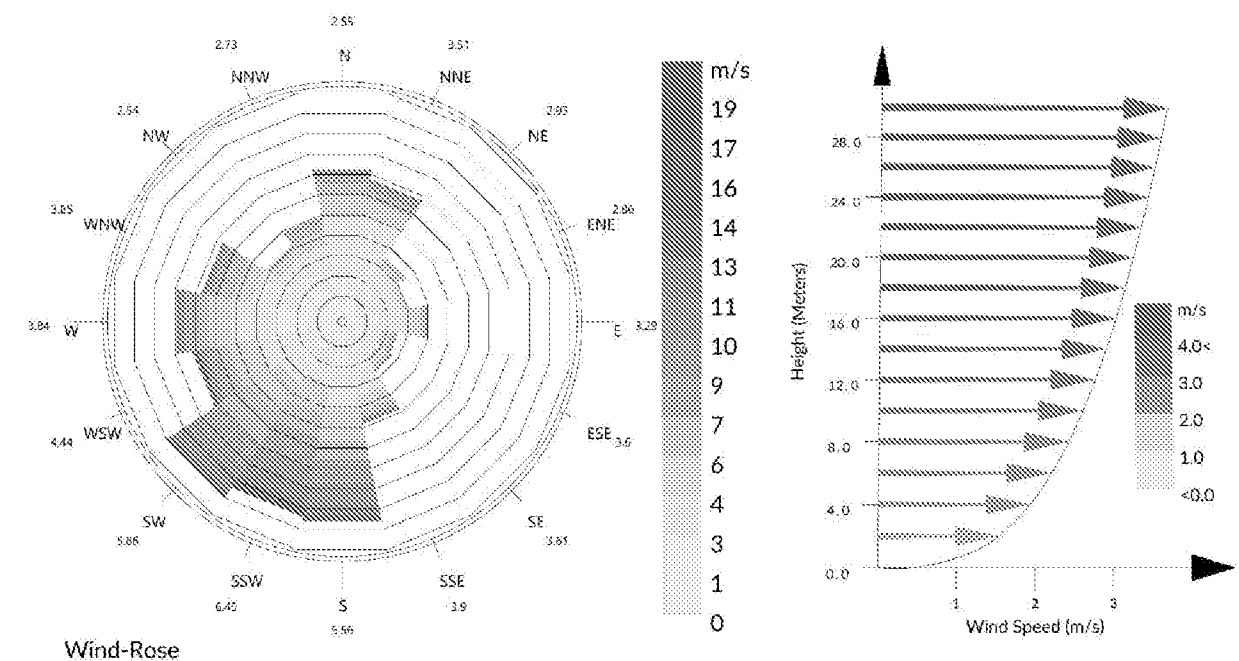


Figure 23: Left – Wind rose showing wind speeds affecting the site. Each enclosed polyline shows a frequency of 1.3% (113 hours). Average wind speeds for each direction are also shown next to the direction markers. Right – Wind boundary chart showing average wind speeds at altitudes between 0 and 30 metres above the ground.

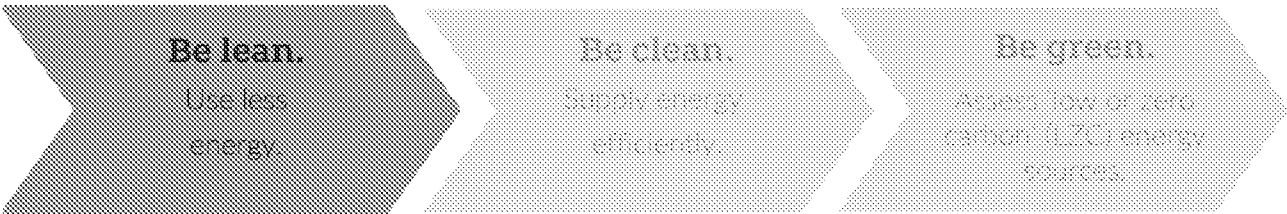
Irradiance

Incident irradiance is an important consideration in the design process for a multitude of reasons:

- Building form – buildings should be designed to avoid 'dark spots' or areas which are not exposed to sufficient levels of sunlight.
- Glazing aspect and ratio – equally, glazed areas exposed to high levels of sunlight can cause undesirable amounts of solar gains and glare. This impacts heating and cooling loads, increases the risk of overheating, and can reduce occupant wellbeing.
- Materials selection – the reflectance of building materials along with their thermal mass dictates how the building will perform when exposed to direct solar radiation. This will impact the thermal demands of the building and consequentially the servicing strategy.
- Renewable generation – technologies such as photovoltaics and solar thermal panels whose output is proportional to the irradiance must carefully consider orientation and tilt to maximise efficiency.

Total annual irradiance for the Proposed Development is approximately 1000kWh/m²/year. The stability of the sun's output means irradiance is unlikely to change, even as the climate warms.

Be Lean.



A fabric first approach will maximise efficiency of building layout and form, as well as the thermal performance of the buildings’ envelopes. This could be achieved through solutions such as low U-values, air permeability and efficient glazing to minimise heat losses in winter and maximise coolth retention in summer months.

Reducing energy demand as a priority has several benefits. It reduces operational energy costs and carbon emissions in the most robust and reliable way, without the need for ongoing maintenance or the replacement of plant.

Fabric performance

Fabric performance is an integral part of sustainable design development. By taking a fabric first approach to building design, the Proposed Development will reduce energy demand passively. These measures are the most reliable, robust, and long-lasting compared with technological solutions.

The overriding objective for the façade design of the buildings at the Proposed Development will be to achieve the optimum balance between providing natural daylighting benefits to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter, and limiting summertime solar gains to reduce space cooling demands.

Thermal insulation

Typically, the demand for space heating is dominant in new homes, whereas non-domestic buildings can be either heating- or cooling-led, dependent on their use. In either case, solar gains will be controlled by the optimisation of the fabric and approach to fenestration i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain.

Glazing energy and light transmittance

The design of homes and buildings will seek to benefit from passive solar heating in winter where appropriate, minimising unwanted summer heat gains whilst optimising the transmittance of light for internal daylight.

Fabric air permeability

Fabric air permeability is a measure of the volume of air that can penetrate through the fabric of a building, leading to ventilation heat loss and gain. High air permeability can lead to uncomfortable drafts and dramatically increase the demand for space heating in winter and space cooling in summer. The buildings at the Proposed Development will aim to achieve good practice levels of air permeability.

The Proposed Development will consider best practice standards such as Passivhaus principles as is appropriate.

Table 3 indicates the level of improvement which may be required to meet the proposed Future Homes Standard and Passivhaus.

	Table 3: Current and emerging fabric performance standards.				
	Building element	Current Part L 2013 notional targets		Passivhaus advised performance	Future Homes Standard
		Residential	Non-residential		
	External wall U-value (W/m²K)	0.18	0.26	0.15	0.11
	Roof U-value (W/m²K)	0.13	0.18	0.11	0.11
	Floor U-value (W/m²K)	0.13	0.22	0.11	0.11
	Window U-value (W/m²K)	1.40	1.60	0.85	0.80
Air permeability (m³/m².hr @50Pa)	5.00	3.00-5.00	1.00	3.00	



Space heating

The strategy for delivering space heating to the Proposed Development aims to remain as flexible as possible, with the aim of delivering low carbon, affordable heat in the most appropriate way as and when serviced parcels are brought forward for development; this is discussed further in the Be Green section.

In order to establish a 'business as usual' case against which to compare technologies, a 'baseline' of energy demand and CO₂ emissions for the development was calculated using benchmark demands for the various building types, as served by a typical gas boiler. This is presented on the following pages.

A potential servicing strategy uses highly efficient electric heat pumps; this is presented in the Be Green section.



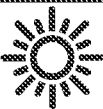
Domestic hot water (DHW) system

As fabric performance improves, the proportion of new homes' energy consumption represented by the demand domestic hot water (DHW) increases.

To reduce the demand for hot water in all buildings, the use of water-efficient fixtures and fittings including flow reducers in the taps of wash hand basins and aerated shower heads could be considered and installed where appropriate.

Wastewater Heat Recovery Systems (WWHRS) could be considered to passively reduce the demand for hot water. These systems capture a proportion of the heat from the hot water which is typically lost to the drain, using it to either pre-heat the incoming water or return heat to a hot water store. By capturing a proportion of the heat from the waste water, WWHRS can reduce both energy demand and CO₂ emissions, as well as reducing the energy cost to occupants. Such systems could be explored.

A potential servicing strategy uses highly efficient electric heat pumps; this is presented in the Be Green section.

	Space cooling Active cooling is often critical for the comfortable operation of many non-domestic buildings, required as the internal gains from equipment and people can result in a propensity to overheat which cannot be mitigated with conventional ventilation. However, effective building design, both from the perspective of architectural form and specification, as well as the building services strategy, can often be used to reduce the risk of overheating prior to any active measures. These passive measures are the most robust and lowest carbon solutions to mitigating the risk of overheating and the Cooling Hierarchy below will be used to prioritise passive solutions in the design of the non-domestic elements of the Proposed Development. Minimise Minimise internal heat gains Reduce Reduce heat entering buildings in summer. Manage Manage heat gains. Passive Ventilation. Passive Mechanical Ventilation. Mechanical Active Cooling. Active Figure 24: Cooling hierarchy.
	Glazing and daylighting The importance of exposure to good daylighting in homes, schools and workplaces is well documented. It improves comfort, wellbeing, and productivity. Glazing is required to provide adequate daylight. However, higher proportions of glazing can increase heat loss in winter months and increase risk of overheating in summer months due to excessive heat gains. The Proposed Development will seek to both reduce energy demand and ensure occupant comfort and wellbeing through appropriate form, fabric and glazing.
	Overheating As a result of the warming climate and improving thermal performance of building fabric, the risk of overheating in dwellings is an ever more present concern. Through good design, this risk can often be mitigated without the need for active cooling, though this requires careful consideration. Assessing both the non-domestic buildings and new homes of the Proposed Development using the recognised methodologies of CIBSE TM52 and CIBSE TM59 through a dynamic overheating model to inform the design and maximise passive approaches to cooling could be considered and conducted where appropriate and useful.

	Heat recovery Mechanical ventilation with heat recovery (MVHR), can be used to maintain sufficient air supply to occupants as well as reduce heating demand through recirculation of waste heat. Mechanical ventilation could be explored for the buildings and homes of the Proposed Development.
	LED lighting For retail and office developments, lighting often represents the majority of energy demand. Commercial buildings at the Proposed Development will seek to specify the highest performance in efficacy (lumens/circuit Watt) to reduce lighting demand and reduce operational costs to building users.
	Metering and controls The Proposed Development will explore opportunities to incorporate smart energy systems and controls to intelligently use energy to minimise energy cost and consequent carbon emissions. These tools can also be used to educate building occupants on energy management and use to implement behavioural change to provide long term positive impacts on and off site.

Be lean results

The following is an appraisal of the anticipated energy requirements and resultant CO₂ emissions that could arise as a result of the Proposed Development, after the inclusion of the passive design and energy efficiency measures described above.

It is anticipated that the Proposed Development will achieve emissions in line with the Building Regulations Part L 2013 gas boiler baseline at Be Lean stage through passive design and energy efficiency measures alone i.e. a 0% reduction in annual regulated CO₂ emissions. Therefore, the Proposed Development at the Be Lean stage is equivalent to the 'Baseline Development' against which other technologies are assessed at later stages of the energy hierarchy.

Energy requirement

The table below outlines the anticipated annual energy requirement by end use for the Baseline Development. Note that these figures represent the total room side energy demand for each use. The total energy consumed by plant and systems includes additional factors for system efficiencies and losses which is not presented here.

The 'Baseline Development' has been produced using benchmark data for Part L 2013 notional buildings deemed representative of the proposed use mix at the Proposed Development, i.e. buildings compliant with current Building Regulations served by a gas boiler.

The anticipated overall site-wide energy demand and consumption from each end use are compared in Figure 25 and Figure 26. This shows that the dominant source of energy demand is associated with space heating (53%), followed by domestic hot water (38%); this is typical of a residential-led development.

It is important to note that this baseline, and the calculations presented herein, are intended only to provide a relative assessment of the benefit of the various technologies being explored for the emerging energy strategy.

Table 4: Anticipated energy demand for the Baseline Development (benchmarked for a Part L 2013-compliant gas boiler strategy).

Space Use	Space heating MWh/year	Cooling MWh/year	Auxiliary MWh/year	Lighting MWh/year	Hot water MWh/year	Unregulated electricity MWh/year
Domestic	4,300	0	106	490	3120	3,600
Non-domestic	100	7	22	57	106	120
Total	4,400	7	128	547	3226	3720

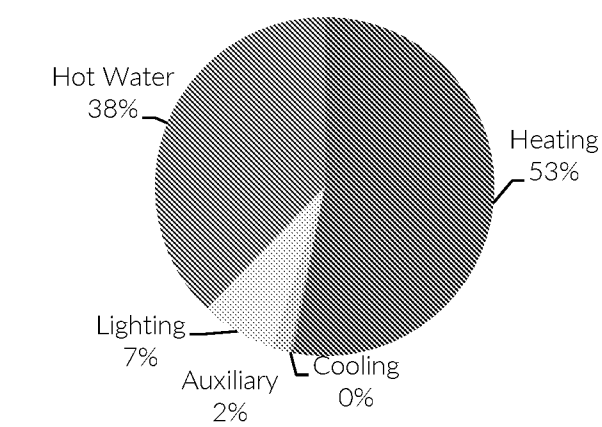


Figure 25: Room side energy demand.

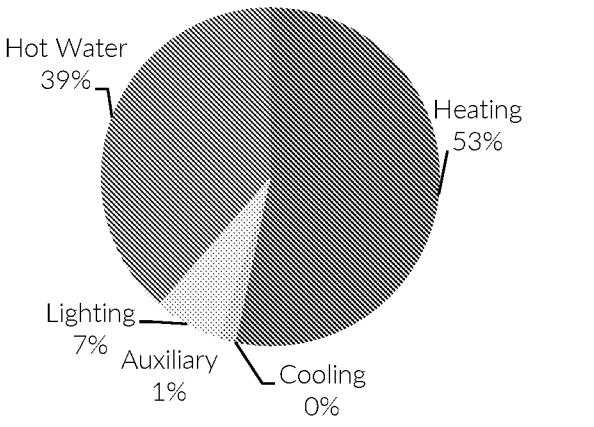


Figure 26: System side energy consumption.

CO₂ emissions

The following tables outline the anticipated CO₂ emissions for the Baseline Development, using both current Building Regulations (Part L 2013) carbon factors and 'real world' carbon factors; taken to be those in emerging building regulations Part L 2020.

A breakdown of CO₂ emissions by end use associated with the site-wide demands are shown in Figure 27 and Figure 28. This demonstrates that, for the Baseline Development, the estimated carbon emissions associated with the space heating and hot water demands are the greatest proportion of the overall emissions when using carbon factors from current Building Regulations. Using 'real world' factors – where electricity is much lower carbon than gas, this is further exaggerated – heating and hot water are increasingly the dominant sources of CO₂ for the Baseline Development, accounting for 95% of overall emissions under a gas boiler strategy.

Table 5: CO₂ emissions for the Baseline Development – current Building Regulations carbon factors.

Space reference	Baseline emissions (current Building Regulations)			
	Regulated TCO ₂ /year	Unregulated TCO ₂ /year	Total TCO ₂ /year	Reg. per sqm GIA kgCO ₂ /year/m ²
Domestic	1,900	1,900	3,800	32
Non-domestic	92	63	155	33
Total	1,992	1,963	3,955	32

Table 6: CO₂ emissions for the Baseline Development – 'real world' carbon factors.

Space reference	Baseline emissions ('real world')			
	Regulated TCO ₂ /year	Unregulated TCO ₂ /year	Total TCO ₂ /year	Reg. per sqm GIA kgCO ₂ /year/m ²
Domestic	1,700	490	2,200	19
Non-domestic	60	15	75	16
Total	1,760	505	2,275	19

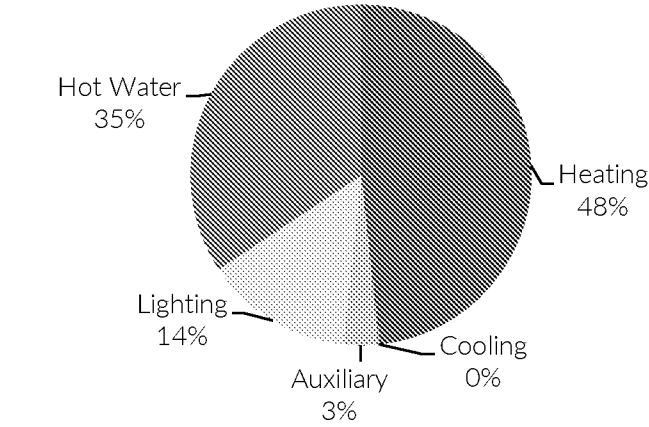


Figure 27: CO₂ emissions – Part L 2013 carbon factors.

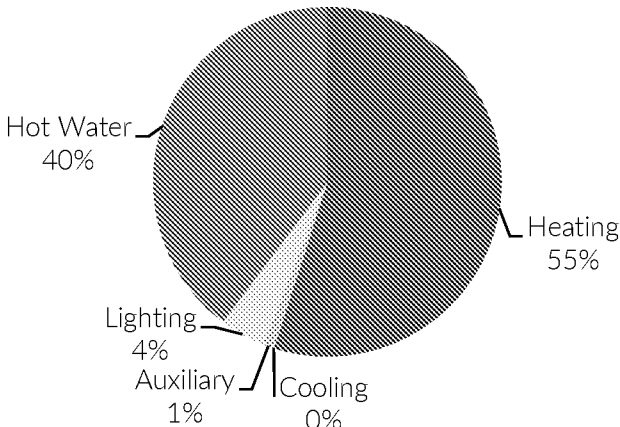


Figure 28: CO₂ emissions – SAP10.1 carbon factors.

Be Clean.



The emerging strategy for the Proposed Development will be determined at reserved matters and will be in line with the building regulations enforced at that time. However, the Proposed Development recognises that an all-electric servicing strategy as a suitable approach to compliance with the emerging Future Homes Standard. By leveraging the continuing decarbonisation of the national electricity grid, the Proposed Development would be low carbon on day 1, reducing to net zero carbon emissions around the mid-2030s.

It is considered that the density of the Proposed Development is not be conducive to the effective or efficient deployment of a site wide heat network. However, with the mix of heating and cooling-led elements in these areas, there is potential for energy sharing, particularly in shoulder seasons.

Electric batteries and other forms of energy storage, alongside demand management, could be explored to add resilience to the strategy and reduce the carbon emissions, by diversifying energy demand away from peak times and maximising the proportion of any renewably-generated energy which is consumed onsite. Research has shown that the carbon intensity of electricity varies by 32% throughout the day on average and over 50% on the coldest winter days. Energy storage enables the demand during highest carbon periods to be avoided, meaningfully reducing carbon emissions.

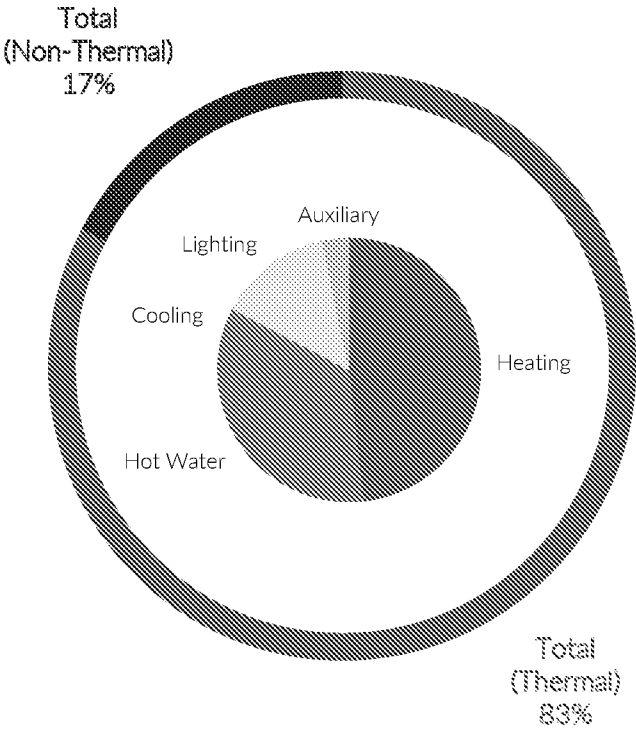
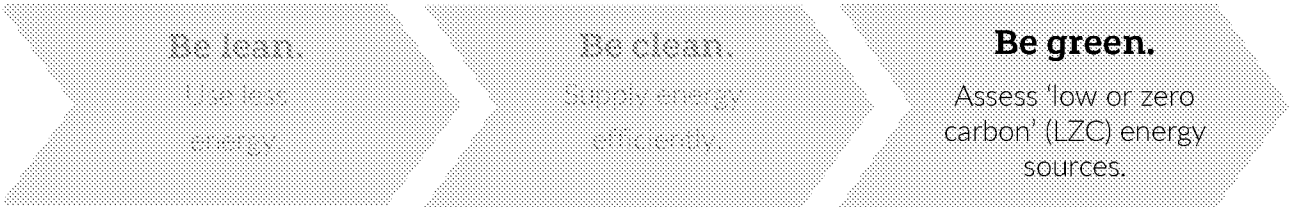


Figure 29: Predicted thermal demand breakdown for the Proposed Development masterplan based on current area schedule.

	All-electric servicing strategy The emerging strategy for the Proposed Development will be determined at reserved matters and will respond to energy landscape at the time of submission. However, the development recognises that an all-electric servicing strategy as a suitable approach to compliance with the emerging Future Homes Standard. The carbon intensity of grid-supplied electricity in the UK has reduced by almost 70% since 2012 and is projected to continue decarbonising to be zero at some point in the mid-2030s, according to National Grid projections (see Appendix C). By leveraging this continuing decarbonisation, the Proposed Development would be low carbon on day 1, reducing to net zero carbon emissions when the electricity grid becomes zero carbon by the mid-2030s.
	Combined heat and power (CHP) CHP offers high emissions savings under the Part L 2013 methodology. However, this is not representative of the performance of CHP in reality. Low carbon grid electricity means CHP can actually increase emissions relative to the development as served by gas boilers (the baseline). Furthermore, CHP requires on site combustion which can have a negative impact on local air quality throughout the lifetime of the development. As such, natural gas CHP is not being explored for the Proposed Development.
	Site wide network There is not currently a heat network within the vicinity to which the Proposed Development could be connected. Heat networks can demonstrate benefits where heat is generated centrally with highly efficient plant and distributed to buildings within the vicinity. However, distribution losses in these systems are typically very high and, for a low density development such as the Proposed Development, are likely to entirely outweigh any benefit that would be realised from generating heat centrally. Heat networks can be beneficial where there is a source of waste heat present which can be uplifted at greater efficiency than generating heat locally. However, it is our understanding that there is no sufficient source of heat which would be viable for such a system.
	Ambient loop energy sharing network So-called ambient loop or fifth generation energy networks differ from traditional heat networks – which generate heat centrally, distributing it to meet the thermal demand of buildings on the network – as they facilitate the sharing of energy between buildings with simultaneous heating and cooling demand. This is achieved by circulating water at ambient ground temperatures, with local heat pumps allowing buildings to both extract heat from and reject heat to the network i.e. buildings with cooling demand are able to share what would typically be waste heat rejected to atmosphere with buildings in the vicinity that demonstrate a demand for heat. Whilst this is not favourable for lower density areas or areas without a mix of heating and cooling demand, for the local centres and commercial areas of the Proposed Development, this may provide a benefit and could be explored.
	Energy storage Energy storage, be that in the form of an electric battery or simply a hot water cylinder, can complement the energy strategy. By storing electricity or heat generated during off-peak times for use when the demand on the grid is greatest, the impact of new development on the resilience of local grid infrastructure can be minimised. Off-peak electricity is also lowest cost and lowest carbon, so deployment of energy storage can also reduce energy bills and consequent carbon emissions. Opportunities for both grid-scale and local energy storage could be explored.

Be Green.

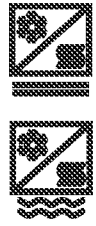


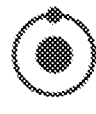
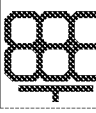
Low and zero carbon (LZC) technologies can be used to extract or generate onsite renewable energy. This can be in the form of renewable heat, such as from the atmosphere or ground, or as renewable electricity, to be used on site or sold back to the national grid to offset emissions.

A potential servicing strategy could be to utilise electric heat pumps to meet the heating and hot water demands of the development. Heat pumps allow the extraction of renewable heat from the atmosphere, ground, or water source, with electrical efficiencies of 250% or more. Air and ground source solutions are being explored, along with ambient loop solutions where these present a benefit.

The potential for solar PV, generating zero carbon electricity, is also being explored to complement the strategy.

Heat pumps significantly reduce CO₂ compared to gas boiler or direct electric heating strategies. Twinned with solar PV, heat pumps offer a route to zero carbon, reducing demand on a strained electricity grid and reducing operating costs. A hydrogen boiler to deliver net zero carbon heat along with low carbon grid electricity and a provision of solar PV offers an alternative route.

	Air source heat pump (ASHP) ASHPs work to extract heat from the air at efficiencies much higher than can be achieved by electric resistance heaters. This improved efficiency of heat generation significantly reduces the energy consumption to heat and provide hot water to a home or building, reducing bills and carbon emissions, whilst also minimising impact on local grid resilience. Heat pumps can also provide cooling in applications which require it, though the design of buildings at the Proposed Development could seek to minimise the need for active cooling. ASHPs are one solution being considered for the Proposed Development, but other heating and renewable technologies will be reviewed. Based on supplying 100% of the heating, domestic hot water, and cooling (where applicable) of the Baseline Development using ASHPs with coefficients of performance (CoPs) of 3.0, 3.0, and 4.0 respectively, it is anticipated that this could achieve a ~21% reduction in regulated CO₂ compared to the baseline when using Part L 2013 carbon factors. When using 'real world' (SAP 10.1) carbon factors, this reduction is anticipated to increase to up to ~67% beyond the Baseline Development. With the projected continued decarbonisation of electricity in the UK, an all-electric strategy such as the ASHP scenario above could provide a viable route to achieving a net zero carbon development in future.
	Ground/water source heat pump (GSHP/WSHP) GSHPs and WSHPs operate in much the same way as ASHPs, instead using the ground or appropriate water body (rather than the atmosphere) as the heat source. This has benefits to the overall efficiency of the system, as the ground/water source typically has a more stable temperature than the air throughout the year, particularly during heating season. However, these systems are more complex and come with increased constraints, with ground source systems typically requiring a large area of land or deep boreholes to operate and water source systems requiring careful consideration, as extracting or rejecting significant amounts of heat to a natural water body can have implications for the local environment and ecology.

	The feasibility of such systems could be explored for the Proposed Development. It is likely that the performance of such systems could meet or exceed that of an equivalent ASHP system, therefore will provide a greater carbon reduction when using 'real world' carbon factors.
	Hydrogen Hydrogen can be combusted to provide zero carbon heating and hot water with water as the only direct emission. Whilst reliant on a suitable supply of hydrogen, new generation 'hydrogen-ready' natural gas boiler can be converted to combust hydrogen with relative ease. The emerging all electric strategy negates the need for natural gas, but appreciating the dynamism in the energy sectors, the Proposed Development would remain flexible to developments in the hydrogen generation and supply sector. Though consideration of the impact on air quality, through the increased NOx emissions produced by hydrogen boilers, would be necessary.
	Photovoltaic (PV) panels PV panels can be used to generation renewable electricity from the sun. This energy can be exported back to the National Grid or directly used on site. The masterplan has both a large available roofscape which could be used for the deployment of PV, along with areas where a ground-based utility-scale array may be appropriate; both are being explored. Should all homes be provided with 6no conventional solar panels (~10sqm), a total annual generation of around 1,285MWh could be realised, sufficient to offset ~10% of the energy consumption of the homes of within the Proposed Development, as calculated using the Building Regulations benchmarks presented in this Energy Strategy. Note, this figure is entirely indicative, and the potential for and suitability of roof-mounted PV will be assessed in more detail at a later stage. Opportunities for strategic-scale ground-based arrays are also being explored.
	Biomass 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, the area take for such plant is high. Furthermore, security of fuel supply is an important consideration. The calculations indicate that the use of a wood-chip biomass boiler to provide 100% of space heating and hot water could yield a ~58% reduction in regulated CO₂ compared to the baseline when using Part L 2013 carbon factors. When using 'real world' (SAP 10.1) carbon factors, this reduction is anticipated to increase to up to ~67% beyond the Baseline Development. However, the proposed development would need ~375 tonnes of wood pellets delivered weekly and ~2,350 m³ of storage space to accommodate fuel. Additionally, the burning of wood pellets would also lead to in a significant increase in NOx emissions from the Site. Given these reasons above, it is not proposed that on-site biomass boilers could be explored further for the Proposed Development.
	Solar thermal panels Solar thermal panels can be used to meet a proportion of a building's thermal demand renewably. PV systems are much simpler and require minimal maintenance, unlike solar thermal systems which are complex and require regularly inspection. As such, solar thermal is not currently being explored in depth for the Proposed Development, but the Southern Consortium is open to discussion should this be deemed a desirable technology by the local authority and community.

Appendix B – Local policy context.

This section summarises key local planning policy relating to energy and wider sustainability considerations. The following documents have been reviewed.

- Arun Local Plan 2011-2031
- Arun District Design Guide – Supplementary Planning Document (SPD)
- Barnhan and Eastergate Neighbourhood Plan 2019-2031
- Aldingbourne Neighbourhood Development Plan 2019 - 2031

Arun Local Plan 2011-2031.

The Arun Local Plan sets out the vision for Arun to 2031 and beyond.

Arun has determined that economic growth for job creation is its number one priority. It wants to enable residents of working age to be able to work within Arun. Increasing 'job density' has been identified as the central theme of this Plan. The Local Plan aims to help to achieve this by diversifying the range of employment sites available to investors; protecting existing viable employment land from other forms of development; encouraging employment growth in manufacturing, cultural, office, leisure, retail, horticulture and marine based activities and; freeing up commercial enterprise through the use of Local Development Orders.

Strategic policies set out the overall strategy for the Arun Local Planning Authority with regard to:

- The amount of new employment, retail and housing development that will take place in the District up to 2031
- A strategic framework to help determine planning applications
- The framework for neighbourhood development, and
- A statutory guide to help local communities deliver local change

Further detail for managing development is set out in the 'development management' Policies that promote sustainable development in the Plan area and cover a broad spectrum of issues including Employment and Enterprise, Transport, Parking and Access, Natural Environment, Water, Waste Management and Quality of the Environment.

The strategic objectives of the Arun Local Plan to be achieved by 2031 are as follows:

Table 7: Arun Local Plan Strategic Objectives

To strengthen Arun’s economic base and provide local job opportunities by increasing, diversifying and improving the quality of employment within the District through the provision of appropriate employment sites, better infrastructure including road access, quality affordable accommodation and the development of business support and partnerships.
To reduce the need to travel and promote sustainable forms of transport.
To plan for climate change; to work in harmony with the environment to conserve natural resources and increase biodiversity.
To plan and deliver a range of housing mix and types in locations with good access to employment, services and facilities to meet the District’s housing requirements and the needs of Arun’s residents and communities both urban and rural, ensuring that issues of affordability and the provision of appropriate levels of affordable housing are addressed while supporting the creation of integrated communities.
To protect and enhance Arun’s outstanding landscape, countryside, coastline, historic, built and archaeological environment, as well as the setting of the South Downs National Park, thereby reinforcing local character and identity.
To create vibrant, attractive, safe and accessible towns and villages that build upon their unique characters to provide a wide range of uses and which are a focus for quality shopping, entertainment, leisure, tourism and cultural activities.
To promote strong, well integrated and cohesive communities, through the promotion of healthy lifestyles, provision of good quality accessible community facilities and a safe environment, which delivers an enhanced quality of life to all. This includes meeting the needs of a growing elderly population.

Policy H SP1 The Housing Requirement identifies both the Proposed Development and Barnham/Eastergate/Westergate (BEW) as strategic housing sites allocating 2,500 and 2,300 housing units to each one respectively.

Arun District Design Guide – Supplementary Planning Document (SPD).

A Consultation Draft of the Arun District Design Guide was issued in January 2020. The Guide been prepared as part of the Arun District Council's commitment to secure the highest quality new development within the District.

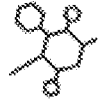
The Arun District Design Guide Supplementary Planning Document (SPD) is intended to provide further detail to the Design policies of the Arun Local Plan and to raise the standard of design across the District. The Arun District Design Guide sets out the Council's expectations with regard to the design quality of new development, and for the preservation, conservation and enhancement of the built and natural environment with its distinctive character and qualities that can be found within the District.

Key policies contained in the Arun Local Plan and the SPD, which will inform the sustainability approach for the masterplan, are summarised in Table 8overleaf.

Table 8: Current Arun District Council local policy summary.

Sustainability Theme	ADC Policy Document	
	Arun Local Plan 2011-2031	Arun District Design Guide – Supplementary Planning Document (SPD)
Building Performance 	ECC SP1 The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of tidal and fluvial flooding; water stress; health impacts as a result of extreme temperatures and a decline in the quality of habitats and richness of biodiversity. Development must be designed to take account of the following issues: a) Location (in relation to flood risk and vulnerability to coastal erosion); b) Water efficiency; c) Shade, cooling, ventilation, solar gain; d) Connectivity to the green infrastructure network; e) Layout and massing; f) Resilience of buildings and building materials to extreme weather events; and g) Capacity of drainage systems and incorporation of Sustainable urban Drainage Systems (SuDS) ECC SP2 - Achieve energy efficiency measures that reflect the current standards applicable at the time of submission; - Use design and layout to promote energy efficiency; and - Incorporate decentralised, renewable and low carbon energy supply systems, for example small scale renewable energy systems such as solar panels. - All major developments must produce 10% of the total predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. Energy efficiency measures will be taken into consideration when the total predicted energy requirements are calculated. The Council will consider ‘allowable solutions’ where it is clearly demonstrated that the provision of on-site renewable or low carbon energy generation is unviable or not feasible. ECC DM1 - The Council will support proposals for appropriately located renewable energy development, and their ancillary development where they meet the following criteria: a. The proposal is located and designed to minimise adverse impacts to landscape, habitats, the historic environment and residential amenity including visual, noise and odour impacts; b. The location and design of proposals will need to take account of the Council’s landscape assessment and landscape sensitivity studies (or successor documents) and proposals for large scale renewable energy projects will need to be supported by a zone of theoretical visibility and viewpoint assessment; c. Priority should be given to proposals that integrate with existing or new development where appropriate to do so having regard to (a); and d. All proposals will need to demonstrate a suitable connection to the electricity distribution network, or appropriate energy storage facility, and provide evidence to demonstrate that the connection will not result in unacceptable impacts upon the landscape, natural and historic environment or visual and residential amenity.	K.01 - All new development including conversions, extensions and changes of use must be designed to reduce energy demand and carbon emissions in line with national and local standards including the Arun Local Plan. - Approaches to design must demonstrate that each step of the energy hierarchy has been followed whilst also ensuring the incorporation of low and zero carbon (LZC) technologies and clear commitments to comprehensive energy monitoring and transparency of performance. - Passive design should be the first step, considering form and orientation, effective insulation, air-tightness and utilising natural ventilation where this can avoid the risk of overheating, both today and in the future. Existing buildings should incorporate retrofitting measures such as cavity wall insulation and additional glazing, but these interventions must be supported by detailed analysis of moisture risk. Energy & Carbon - Make sure the scheme: - Sets targets for energy and carbon reductions beyond the relevant Part L Building Regulations. - Demonstrates consideration of embodied carbon (emissions from the manufacture, transport and construction of building materials, together with end of life emissions). - Incorporates passive solar design measures such as avoiding single aspects, including south facing windows on habitable rooms, minimising north-facing glazing, using roof lights and providing shading to south facing windows through tree cover. - Where mechanical ventilation is installed these are heat recovery systems (MVHR). Considers the ventilation strategy alongside proposed air tightness levels, to ensure buildings are not left susceptible to mould growth. This may include hydrothermal modelling. Feasibility studies should be carried out to explore a range of passive design measures and low and zero carbon technologies appropriate to the site, to reduce energy consumption to a minimum. Following the energy hierarchy, once maximum savings have been achieved through passive design, a further minimum 10% of the energy requirement should be generated through on-site renewable or low carbon technologies.
Water & Drainage	W SP1 - Arun District Council will encourage water efficiency measures in order to protect the District's water resources and enhance the quality of the water environment which supports a range of habitats and ecosystems. Development will be encouraged to make active use of surface water as a	K.02 - The consumption of potable water should be minimised in developments through all viable measures. The approach should follow the water hierarchy, with low-flow technology water fittings, and rainwater harvesting and grey water recycling systems integrated where viable. The placement of features such as water storage

Sustainability Theme	ADC Policy Document	Arun District Design Guide – Supplementary Planning Document (SPD)
	design feature and permitted where it identifies measures to improve and enhance waterbodies, coastal habitats or provides additional flood relief. - The Council will also support development that: a. is appropriately located, taking account of flood risk and promotes the incorporation of appropriate mitigation measures into new development, particularly Sustainable Drainage Systems that reduces the creation and flow of surface water and improves water quality; b. reduces the risk to homes and places of work from flooding whilst increasing biodiversity; c. delivers a range of community benefits including enhancing the quality of life and providing greater resistance to the impact of climate change. W DM1 - To ensure that all new development of two dwellings or more are water efficient and reduce pressure on water abstraction sites, it must include measures that meet the optional standards of 110 l/person/day.	tanks must not impact negatively on buildings or the street scene, which may be achieved by placing these underground, although this is not appropriate for all locations (e.g. on the coastal plain). Water & Materials - Make sure that the scheme: - Applies the waste and water hierarchies. - Re-uses and/or recycles materials arising from demolition and remediation works. - Provides adequate space and opportunities for managing waste on-site where viable. - Waste compactors and de-watering systems can help reduce waste volumes. - Targets potable water consumption of <110l/person/day through the incorporation of high efficiency fixtures and fittings and grey and rainwater harvesting systems to reduce demand on local water supplies. - Includes infrastructure for monitoring water consumption and leak detection. Leak detection will also reduce risk of localised flooding.
Flood Risk 	W DM3 - To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process. - Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include: - Green roofs - Permeable driveways and parking - Soakaways - Water harvesting and storage features including water butts. - Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development. - In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must: a. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA. b. Undertake up to six months groundwater monitoring within the winter period. c. Undertake winter percolation testing in accordance with BRE365. d. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event. e. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.	E.01 - SUDS should be identified, understood and incorporated into a proposed design in order to mitigate flood risk, improve water quality and provide attractive, multi-purpose spaces. These systems should be taken into account from an early design stage via incorporation into the proposed Landscaping Strategy. - SUDS can be adapted to suit any site and can contain different and various components, with multiple applications and benefits to achieve sustainable water management. When creating a SUDS network, various factors need to be considered at different scales: - Masterplan Scale: water demand, efficiency, space provision, river corridors, habitats, soil, landscape, geology - Site Scale: existing natural drainage patterns, runoff rates, storm water train of features amenity sensitive, “place making” and landscape character - Building Scale: water efficiency features, green roofs, living walls, water butts etc. K.04 - New developments should seek to reduce flood risk through incorporation of Sustainable Urban Drainage Systems (SUDS), which can take a variety of forms including permeable hard surfacing, water harvesting, storage features, green roofs, attenuation ponds and soakaways. These should be integrated with the overall Landscaping Strategy and existing natural features on site, seeking to provide additional recreational and wildlife habitat benefits where possible, while reducing impermeable surface cover. Flooding and Drainage - Make sure that the scheme: - Locates new development in areas at lowest risk of flooding (whether existing or future) - Does not increase flood risk and decreases risk wherever possible, providing appropriate protection throughout the lifetime of the development. - Demonstrates consideration of appropriate SUDS, and aims for these to provide additional amenity or ecological benefits. - Demonstrates flood resilience for a 1/100 year event, in line with BREEAM 2018 Pol 03. - Manages pollution risk entering water-bodies or sensitive receptors from stormwater runoff. - Avoids increasing impermeable land cover, or demonstrates how this is offset. - Retains existing drainage features and flood defences, or compensates for their loss and integrates drainage features and flood defences with the surrounding environment.
Waste	WM DM1 - Proposals for development anticipated to cost over £300,000 must identify the volume and type of materials to be demolished and/or excavated as part of the development. Opportunities for the re-	H.07

Sustainability Theme	ADC Policy Document	Arun District Design Guide – Supplementary Planning Document (SPD)
	use and recovery of materials on site must be demonstrated and off-site disposal of waste must be minimised and managed. - New residential development, including conversion of one dwelling into multiple units, will be permitted provided that: a. It is designed to ensure that kerbside collection is possible for municipal waste vehicles b. Where appropriate, communal recycling bins and safe bin storage areas are available to residents of flats.	- The provision of waste and recycling storage facilities and utilities should serve to meet the requirements of the users of a building or space while seeking to be as unobtrusive as possible. Storage & Utilities - Make sure that the scheme: - Provides sufficient space to store the volume of bins and containers necessary to meet the needs of the building's occupants and in a convenient and safe location. - Integrates waste storage facilities into the existing environment through consideration of placement, form and materials. - Ensures convenient access for service vehicles, providing sufficient space and avoiding the need for frequent turning. - Integrates utilities with the public realm, locating cable runs underground although not in conflict with tree roots, and ensuring that above-ground elements are placed discreetly. - Provides convenient utilities maintenance access. K.02 - Circular economy principles aim to reduce the impact of resource consumption through promotion of natural and bio-based materials, designing out waste, pre-fabrication and effective deconstruction, and building in capacity for future adaptability. Appropriate facilities to manage operational waste should be integrated, while ensuring that these do not negatively impact their setting.
	D SP1 - All development proposals should seek to make efficient use of land but reflect the characteristics of the site and local area in their layout, landscaping, density, mix, scale, massing, character, materials, finish and architectural details. - Development proposals should have been derived from: a thorough site analysis and context appraisal; adherence to objectives informing sustainable design (inclusivity, adaptability, security, attractiveness, usability, health and wellbeing, climate change mitigation and habitats); and the influence these objectives have on the form of the development.	L.02 - Good design should be built to remain high quality for the long term. Buildings and spaces must be able to withstand the wear and tear that comes with continued use and exposure to the elements without the requirement for frequent, difficult or expensive maintenance. - The selected materials need to be durable and robust to wear and tear while ensuring easy maintenance, and providing a high standard of design. L.03 - The use of innovative, creative or modern design or construction techniques, such as modular building, will be encouraged when these result in a high quality of development that responds positively to its setting within the District. - Applicants are encouraged to use innovative construction techniques such as modular building where these can be used to secure an uplift in design quality. Modular and off-site construction should not give rise to uniform and standardised development, but rather use modular units creatively to respond and add to local character.
	ENV DM5 - Development schemes shall, in the first instance, seek to achieve a net gain in biodiversity and protect existing habitats on site. - They shall also however incorporate elements of biodiversity including green walls, roofs, bat and bird boxes as well as landscape features minimising adverse impacts on existing habitats (whether designated or not). - Development schemes shall also be appropriately designed to facilitate the emergence of new habitats through the creation of links between habitat areas and open spaces. Together, these provide a network of green spaces which serve to reconnect isolated sites and facilitate species movement.	E.02 - Trees, hedgerows and planting are particularly important landscape features, having benefits in terms of ecology and biodiversity (both as important species themselves and providing habitats for further protected species), air quality, carbon sequestration, reducing the urban heat island effect, and providing character to an area. E.03 - Appropriate provision should be made for important habitats and species which may be affected or could be enhanced by development activity. Arun District contains a number of protected habitats, and planning policy imposes significant restrictions on the amount and type of development that can take place in these areas in order to prevent adverse effects. Biodiversity - Make sure that the scheme: - Provides up-to-date details of any protected habitats, species or other features with high biodiversity or ecological value, identified by technical studies. - Does not result in any adverse impact on protected habitats unless in exceptional circumstances.

Sustainability Theme	ADC Policy Document	Arun District Design Guide – Supplementary Planning Document (SPD)
	Arun Local Plan 2011-2031	
		- Avoids harm to protected species, including but not limited to bats, badgers, and various wild birds, invertebrates, fish, plants and ancient woodland/veteran trees. - Details measures to mitigate harm caused to biodiversity from the development where avoidance is not possible. - Provides increased and enhanced biodiversity wherever possible, which may include enhancement of existing or creation of new habitats through measures such as planting, bird and bat boxes or provision of nesting locations. - Connects fragments of green space with ecological corridors to improve biodiversity and include plant species to encourage pollinators.
Transport 	T SP1 - To ensure that growth in the District strengthens Arun's economic base, reduces congestion, works to tackle climate change and promotes healthy lifestyles, the Council will ensure that development: provides safe access on to the highway network; contributes to highway improvements and promotes sustainable transport, including the use of low emission fuels, public transport improvements and the cycle, pedestrian and bridleway network. - Proposed Developments needs to be supported by an effective and deliverable Transport Assessment which demonstrates that the transport effects of development on the local and strategic road network can be satisfactorily mitigated and a Travel Plan, which is effective and deliverable,	I.01 - Car parking should be provided through a variety of solutions which are appropriate to their context, the size and nature of development, and the order of the street. An appropriate balance should be struck between too much parking, which can visually dominate the street, and too little which can cause frustration and lead to parking in inappropriate locations with aesthetic, health and safety implications. - The Arun SPD recommends that, outside the coastal town and service centres (which should incorporate lower provision), new residential dwellings of 1-3 bedrooms are allocated 2 parking spaces, and residential dwellings of 4+ bedrooms, 3 parking spaces. Visitor parking must be provided at a ratio of 20% of the total number of residential units. I.02 - All new development, including conversions, should therefore make appropriate provision for electric and plug-in hybrid vehicle parking and charging as per the relevant local parking standards. Electric Vehicles - Make sure that the scheme: - Encourages the uptake of low-emission vehicle use through provision of active charging points meeting the requirements set out in the Arun District Parking Standards Guidance. - Provides Electric Vehicle and plug-in hybrid charging for all parking space types. - Integrates charging points with surrounding buildings and public realm. In particular: - Charging stands should be no more than 1.6m high. - Private charging points should not be visible from the public domain, wherever possible, or use recessive colours to minimise their impact. - Charging points should contain external lighting. - Ensures that future demand can be met by providing passive infrastructure, including sufficient electricity supply. I.03 - Provision of appropriate, conveniently-located cycle parking at homes, community facilities, places of work and neighbourhood and town centres is an important part of encouraging a modal shift away from car use to more sustainable modes of transport. - The Arun District Parking Standards SPG states that all dwelling types should incorporate at least one cycle space per unit, with the exception of 3+ bedroom homes which must provide two or more. Cycle Parking - Make sure that the scheme: - Provides appropriate levels of cycle parking according to the Arun District Parking Standards SPG (2019 draft) and West Sussex County Council Parking Guidance. - Provides cycle shelters for residential development to protect cycles from the elements and to keep cycles secure. - Integrates stands and shelters into the existing built environment in an attractive way, including multifunctional street furniture, through appropriate materials and screening. - Provides spaces for a range of cycles including scooters and those adapted for disabled people.

Sustainability Theme	ADC Policy Document	Arun District Design Guide – Supplementary Planning Document (SPD)
	Arun Local Plan 2011-2031	
Health & Wellbeing 	HWB SP1 - All development shall be designed to maximise the impact it can make to promoting healthy communities and reducing health inequalities. In particular regard shall be had to: a. Providing or contributing to the necessary infrastructure to encourage physical exercise and health, including accessible open space, sports and recreation facilities (including outdoor fitness equipment) and safe, well promoted, walking and cycling routes. b. Creating mixed use development and multi-use community buildings that reduce the need to travel by providing housing, services and employment in close proximity to each other; and c. Ensuring that arts and cultural facilities are accessible to all residents and visitors to the District. - Where new health, recreation and leisure facilities are planned, where possible, these shall be located along public transport corridors that are easily accessible to members of the wider community.	K.06 - Provides supporting facilities such as showers, changing rooms and lockers where appropriate to encourage uptake. - There are a number of factors that contribute to the health and well-being of building users. Adequate provision of daylight while avoiding glare, vibrant, collaborative soundscapes in addition to tranquil environments. Variation in audible and visual environments and amenity space provides choice and flexibility of use. Providing building users with flexibility and choice, including some control over heating and cooling is critical. - Materials containing chemicals known or suspected to be hazardous to human health should be avoided and the availability of clean and fresh air maximised. Introducing internal and external planting can help to passively regulate air quality and temper humidity. The application of biophilic design (e.g. incorporation of plants, natural lighting, natural materials, images of nature, water features, etc.), is also integral to providing connection to the natural environment. This has proven positive effects including reducing stress, blood pressure and heart rates. - Ensure that developments offer individuals and communities the greatest potential to lead active and healthy lifestyles incorporating the Sport England & Public Health England Active Design Principles. Furthermore, development should promote inclusive design – spaces that are accessible and usable by all).
Pollution 	QE DM1 - Residential development likely to experience noise from road, rail or air, in particular development in close proximity to: - A284/A259 Wick roundabout - Stretches of the A27 around Arundel and Fontwell - Sections of the A29 and A259 in Bognor Regis - A284 in Littlehampton and - The stretch of railway line that runs through Barnham station must: a. Be supported by a noise exposure category (NEC) assessment and designed to ensure that residents will not be adversely affected by noise. b. Consider both the likely level of exposure at the time of application and any increase that might be reasonably expected in the foreseeable future. New noise generating development - Developers proposing new noise generating development must seek advice from an early stage to determine the level of noise assessment required. Proposals will need to be supported by: a. Evidence to demonstrate that there are no suitable alternative locations for the development. QE DM2 - Planning permission for proposals which involve outdoor lighting must be accompanied by a lighting scheme prepared according to the latest national design guidance and relevant British Standards publications. QE DM3 - All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by: a. Ensuring the development is located within easy reach of established public transport services; b. Maximising provision for cycling and pedestrian facilities;	K.05 - Controlling pollution is essential to maintaining and enhancing the quality of the environment. This includes air pollution during the construction and the operation of developments through emissions from transport, combustion systems, cigarette smoke, building materials, and biological pollutants, including mould. - Internal air pollution can be mitigated through the removal of sources of pollutants from near building openings and use of filters in mechanical ventilation systems to prevent them from entering occupied spaces. Outdoor air pollution can be avoided through the removal of, or limits placed on the source of pollutants. Both indoor and outdoor air pollution can be further alleviated through use of natural vegetation. - The impact of noise from developments during their construction and operation on residents and wildlife also requires mitigation. Development may be limited in noise sensitive areas and measures must be installed to attenuate noise at its source to a level that complies with BS 8233:2014. Wildlife and views of the night sky also require protection from artificial lighting at night, in alignment with the LP Guidance notes for the Reduction of Obtrusive Light, 2011. Environmental Quality - Make sure that the scheme: - Considers a range of noise attenuation measures to meet the criteria of BREEAM 2018 issue Pol 05. - Considers measures for improving the quality of sound in internal spaces. - Includes measures for improving air quality outlined in the WELL Building Standard. - Incorporates night time lighting only where this is emergency lighting. All external lighting should have controls for dimming or switching off outside of daylight hours. - External lighting should align with ILP Guidance notes for the Reduction of Obtrusive Light, 2011 and limitations for exterior lighting installations. Proposals should be informed by Noise Assessments, Air Quality Assessments and Lighting Assessments, each carried out by the appropriate qualified specialist with consideration of the relevant industry guidance.

Sustainability Theme	ADC Policy Document	
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	c. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points; and d. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network. - Development proposed nearby any Air Quality Management Area (AQMA) declared within the District within the Plan period, will require an air quality assessment to identify likely impacts of development upon the designated area. Developers will be required to ensure delivery of the actions set out within any Air Quality Action Plan.	
Community 		F.01 - A successful movement framework should be easily accessible by all including the young, elderly and those with disabilities or other movement difficulties; and encourage healthy and sustainable choices, making it as easy to walk, cycle or take public transport as it is to drive. G.01 - It is important that new development either connects to, adds to, enhances or incorporates an identifiable centre. This can take the shape of a focal public space or feature of the built or natural environment. A centre can also comprise a range and number of services and facilities relevant to the scale of development. Centres - Make sure that the scheme: - Incorporates or provides access to a neighbourhood centre or focal point within an appropriate distance of residential development, ensuring access to everyday local facilities. - Provides access to appropriate services and facilities at larger scales, connecting to existing centres or incorporating these into the design of the scheme. - Integrates community facilities and services with residential development to create vibrancy and activity, while ensuring residential amenity. - Incorporates public realm elements to make centres attractive, safe, welcoming, easily navigable and accessible for all. H.03 - All development should enhance the provision, quality or accessibility of open spaces, sports, community and leisure facilities, whether by appropriate contribution through planning obligations, or direct provision. H04 - All development should provide residents with access to outdoor amenity space, whether private or communal: - Private amenity spaces are the enclosed area within a dwelling curtilage from which the public is excluded. Privacy should be ensured by using the 25-degree and 45-degree rules explained in Section G.03 in order to minimise overlooking. - Communal spaces (common in flatted developments) provide an element of amenity to complement lower levels of private outdoor space. These can be provided as exterior spaces enclosed by block buildings, or first floor roof gardens enclosed by courtyard buildings. Communal spaces should be safe, usable, designed to a high standard and well managed; being subject to natural surveillance from both people moving through the space and from windows. The amount of shared space to be provided will depend on the quality, quantity and accessibility of local public open space, but rough guidelines are provided below. - Outdoor amenity spaces may comprise gardens, balconies, play areas, allotments, community gardens, or public spaces; and in combination should provide for a range of activities including relaxation, play, gardening, hanging washing and socializing. H06

Sustainability Theme	ADC Policy Document	
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		- The design and location of street furniture, lighting and public art should be considered at an early design stage, and should be simple, high quality, responsive to context, robust and able to withstand continued use and exposure to the elements over the long term.

Appendix C – Decarbonisation of the electricity grid.

Historic progress in decarbonising electricity

The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed – is recognised in current Building Regulations as being 0.519 kgCO₂/kWh. However, the national mix of electricity generation methods is progressing towards greener solutions with renewable sources accounting for 33.4% of the electricity generated in the UK in 2018; up from 24.4% in 2016 (Ofgem).

As a consequence, the Building Regulations Part L 2013 value of the National Grid carbon factor has been shown to be substantially higher than how the grid is performing in reality. This severely impacts the calculated emissions produced by all heat raising plant which either use electricity directly or generate it to offset other emissions. Figure 30 shows how the mix of generation techniques serving the National Grid, as well as the associated carbon factor, has varied over the past seven years – encouragingly, the carbon intensity of the grid has reduced to almost a third of its value between 2012 and 2018 – to 0.177 kgCO₂/kWh (BEIS). The carbon emissions associated with electricity consumption are therefore much lower than reported in Building Regulations. This means that, under the Part L 2013 methodology the CO₂ emissions associated with electrically-driven plant are being overestimated by over 200%.

Future projections

The Future Energy Scenarios (FES) document, produced by the National Grid, discusses how the UK's energy landscape is changing. The FES 2020, makes projections of how the mix of generation in the grid is likely to change between now and 2050 – the year by which we have a legally-binding obligation to achieve Net Zero greenhouse gas emissions in light of the IPCC's and Committee on Climate Change's 2019 reports.

The latest version, FES 2020, discusses these projections in four scenarios and Figure 30 combines these future trajectories with the actual carbon intensity of the National Grid over the past 12 years. The reported emissions associated with electricity generation have fallen steeply since 2012 and in three cases, the FES 2020 scenarios see carbon factors trending towards zero by the early 2030s. This is on the basis that FES 2020 have deemed it necessary to offset other industries such as freight, shipping and aviation, which will be unable to reduce their carbon emissions to zero. Offsetting the emissions of other industries will involve Carbon Capture and Storage (CCS) technologies on a significant scale in order for the UK as a nation to meet net zero carbon by 2050. It is important to note that CCS technology is not currently commercially demonstrated at a large scale, but the FES 2020 studies are useful as future scenarios.

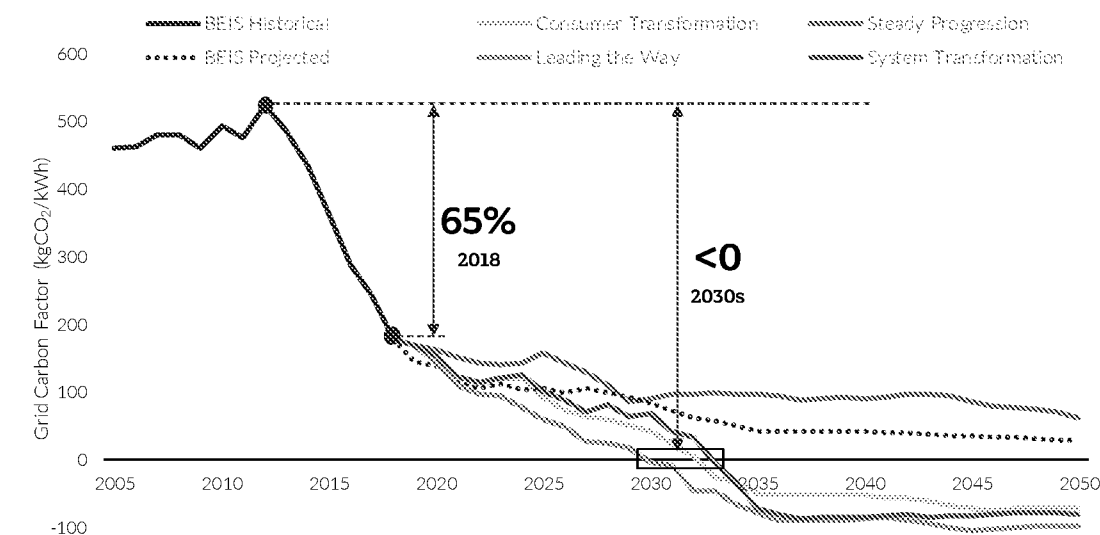


Figure 30: Historic and future projected carbon factor for the National Grid. Sources: BEIS Green Book (historic carbon factors); National Grid Future Energy Scenarios (FES) 2020 (future projected carbon factors).

Shifting focus

As the carbon emissions associated with the generation of electricity continue to reduce, the proportion of the UK's overall greenhouse gas emissions for which the electricity sector is responsible will fall. In fact, transport has now replaced energy supply as the greatest single contributor, responsible for 26% of national greenhouse gas emissions (BEIS).

The carbon factor of natural gas is likely to remain relatively static. With 85% of homes in the UK relying on gas to supply their heating and hot water, as well as a significant proportion of commercial buildings, heating buildings and industry represents an ever-greater proportion of UK emissions – 32% in 2015 (BEIS). In order for the UK to maintain a trajectory sufficient to meet the 2050 decarbonisation target, focus must necessarily shift to other contributors.

The BEIS Clean Growth Strategy provides an indication of the direction the UK's energy policy is likely to take and "...sets out [the government's] proposals for decarbonising all sectors of the UK economy through the 2020s." This includes investing in infrastructure and mechanisms to facilitate a transition to low emission vehicles and strengthening the energy performance requirements of new and existing buildings.

Route to zero carbon

Considering the continued decarbonisation projected for the UK electricity grid, it is important for developers and designers to design not only for compliance, but for future decarbonisation.

With the carbon factor for electricity currently around 35% lower than natural gas and the gap set to widen, an electric servicing strategy offers reduced carbon emissions both now and in the future, particularly if using an efficient heating system such as a heat pump. This is shown in Figure 31.

Additionally, with the carbon factor for electricity set to reduce zero by the mid-2030s, an electric strategy would offer true on site net zero carbon operation at this time.

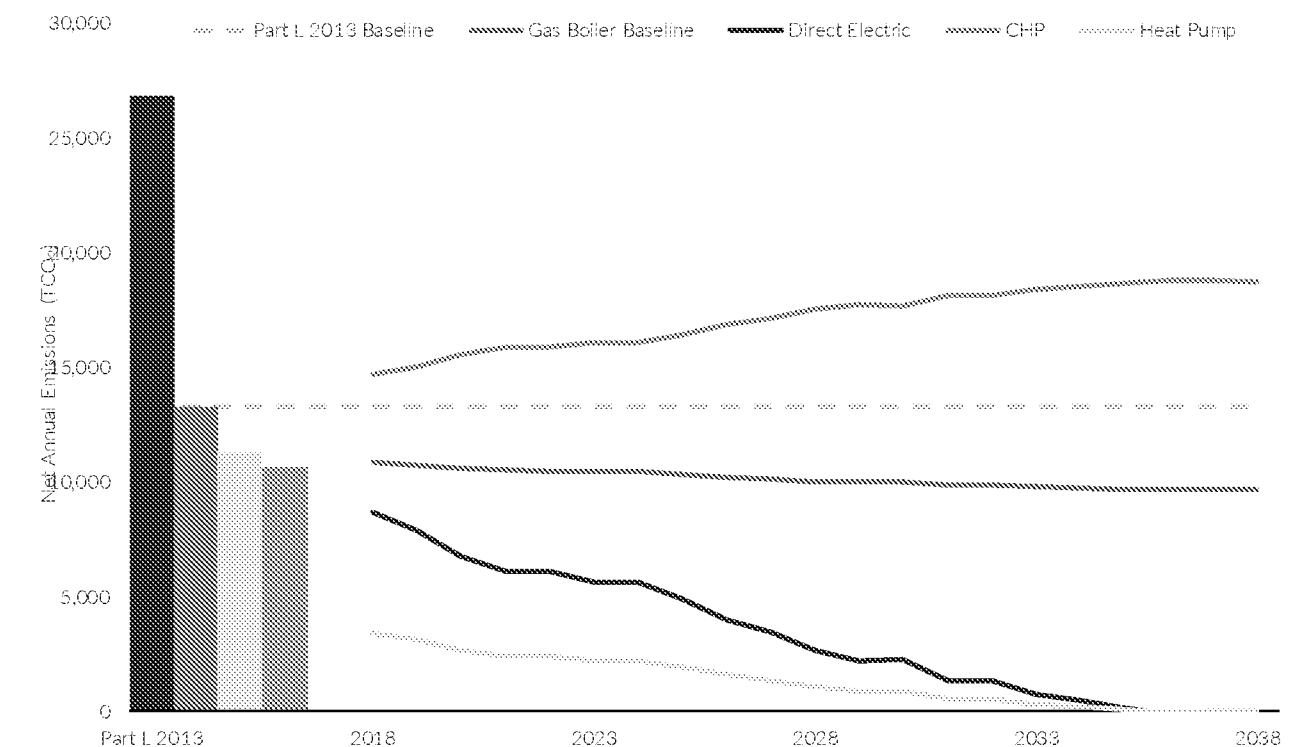


Figure 31: Net annual emissions for the Proposed Development for a variety of servicing strategies under Part L 2013 and projected using mean of the bookend Future Energy Scenarios 2020 projections for the UK grid carbon factors.

Other considerations

Operational cost

Whilst electricity offers increasing benefits from an emissions perspective, the operational cost of such a strategy should be considered.

Electricity currently costs around four times more than natural gas to a typical consumer, meaning that simply substituting a direct electric heating strategy for a gas boiler-based one would see consumers' energy bills nearly quadruple.

With 11% of households in the UK living in fuel poverty, this cannot be an acceptable solution. However, with improvements to building fabric reducing demand and highly efficient heating systems such as heat pumps offering efficiencies of 300% or more, the operational cost of such a strategy should be comparable to a typical gas boiler.

Demand reduction vs. diversification

The decarbonisation of electricity in the UK has been driven by an increasing deployment of renewables such as wind and solar. Whilst these sources are zero carbon, they are intermittent and do not offer the dispatchable generation of gas, coal, or nuclear.

As such, the grid is only as green as the generation available at the time of demand. At peak time (5pm-7pm), it is frequently the case that significant gas, and in the winter, coal, is required to supplement the renewable electricity being generated. This means the carbon factor for electricity varies by an average of 32% throughout the day, rising to as much as 50% in winter months. The average hourly carbon factor for 2019 is shown in Figure 32.

As a result, diversifying *when* a development uses electricity may be as, if not more, important than reducing its demand for energy. With the advent of smart meters and the impending proliferation of smart appliances and devices, which will use electricity when it is greenest, our homes and buildings will automatically minimise their emissions.

The primary driver for this will most likely be the price of electricity, rather than carbon content, meaning electricity providers will sell electricity cheapest when demand is lowest, with the added benefit of reduced energy bills as well as carbon emissions.

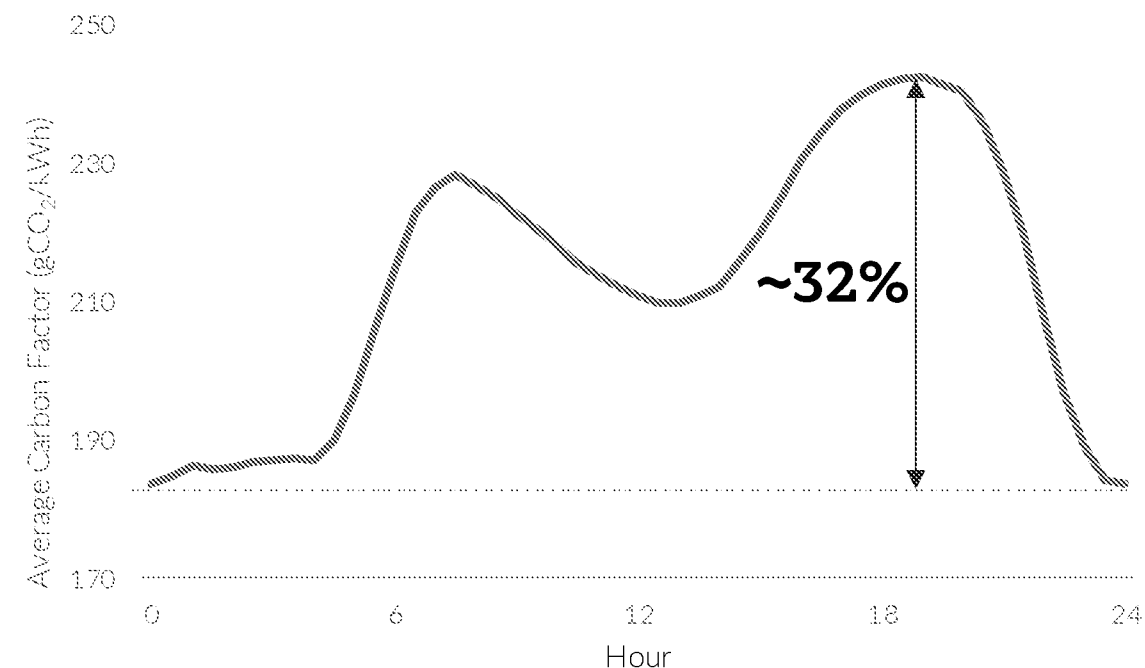
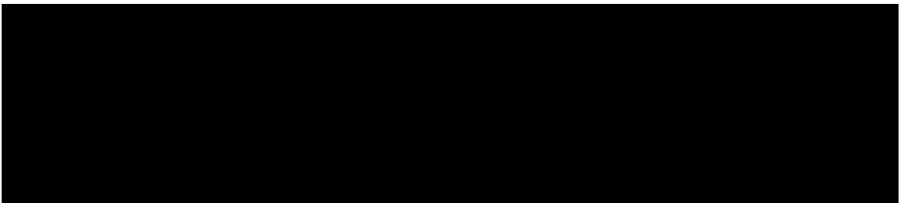


Figure 32: Average hourly carbon factor throughout the day for 2019 (source: <https://carbonintensity.org.uk/>).

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