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Birmingham Smithfield

Zero Emissions City Framework

January 2017

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Foreword from Birmingham City Council

Lisa Trickett
Councillor

The world's cities, global centres of human and economic activity, face numerous challenges in the 21st century; arguably the most pressing is climate change, which puts at risk economic growth, health and wellbeing and the physical and natural environment. Yet it is cities that are uniquely placed to respond to the challenges related to climate change and make a difference to the way our world operates and grows through the type of development and systems they support and encourage. This was recognised at the 2016 COP21 Summit in Paris where city leaders came together to press for change and to support one another in achieving a different future for their citizens, in social, economic and environmental terms.

As a city committed to reducing its impact on the global climate, Birmingham has set itself an ambitious city target of a 60% reduction in carbon emissions by 2027; we are currently at a 33% reduction since 1990 and we will need to work much harder over the next 10 years to realise the remaining 27%, not forgetting the emissions beyond that. The way we move around; the way we heat and power our buildings; and the way we integrate natural capital and green and blue infrastructure into the city will be critical in reducing carbon emissions and adapting to climate change - and our future success will depend on it.

The Birmingham Development Plan, recently approved by the Secretary of State, indicates the volume of growth that we are anticipating in the city: the need for an additional 80,000 homes, 407 hectares of employment land and high quality jobs for the 150,000 additional people that we are expecting to be living here by 2031. With growth comes great opportunity, but also huge pressure on infrastructure, resources and the environment; we need to ensure this growth is as sustainable as possible.

Smithfield, one of the major city centre locations for growth in Birmingham, offers huge potential to demonstrate how communities can be built in a way that not only reduces the carbon impact of new developments, but may also actively contribute to wider carbon reduction. This may be through using the development to become a net exporter of energy; through actively integrating green infrastructure and natural capital into the built environment; or through prioritising cycling as the mode of transport at Smithfield as examples.

Working with the World Business Council for Sustainable Development, through its Zero Emission Cities programme, we have been able to articulate the priorities for Smithfield in a coherent way, identifying what it is we want to prioritise and the outcomes we want to achieve for the citizens of Birmingham. But this hasn't been undertaken in a commercial vacuum; we also want to ensure that Smithfield is a development that will provide return on investment whilst simultaneously providing high quality office space and a healthy living and working environment.

This report is a great step forward in achieving a greener, healthier and happier future for the citizens of Birmingham and demonstrating what can be achieved in reducing the carbon impact of growth.

Foreword from WBCSD

Roland Hunziker
Director, Sustainable Buildings and Cities

In early 2015 the WBCSD approached Birmingham City Council (BCC) to explore a collaborative project to help the city achieve its ambitious CO_2 reduction goals (60% reduction by 2027). By working with a group of leading global companies in a strategic, pre-commercial engagement, the project aimed to develop a sustainability framework to support BCC meet its sustainability aspirations.

The Birmingham Smithfield redevelopment site was identified as an ideal testing ground for this collaboration. As a landmark inner-city development, the project offered the scale and timeline for BCC to work with the partner companies so that they could provide their expertise directly to the city.

Smithfield is an urban redevelopment site with the potential to become an international reference case: “What will be truly transformational is the creation of a legacy for the city; a place for people that stands the test of time as an international exemplar of sustainable development.” It offers the potential for replication across Birmingham if it proves successful. In the Smithfield Masterplan, BCC states its vision for the site as a “sustainable, green and inclusive place that has people at the heart of a zero carbon development”.

With the combined expertise of our member companies participating in the Zero Emissions Cities project, WBCSD has developed this sustainability framework that places the zero emissions goal at the heart of a holistic sustainable urban development plan made up of 10 sustainability categories. This Zero Emissions Cities framework has been developed in close collaboration with the relevant technical departments of BCC and the member companies.

The delivery of this document marks an important milestone – it has been wonderful to see how excited the involved people from across different city departments and technical functions have been in creating this ambitious plan together. They have discussed with the WBCSD project team as well as among themselves how the city ambitions could be set as high as possible across different sustainability categories. As a result, and supported by a cost-benefit analysis delivered by the WBCSD project team, this framework provides an ambitious, yet realistic and implementable plan to make Birmingham Smithfield a zero emissions and highly sustainable community.

The next priority will now be to implement the principles and targets set out in the document during the development process. WBCSD is ready to continue supporting BCC to ensure that the set targets can be achieved, by working with the city and the development partners and bringing in expertise and best practice examples from WBCSD’s membership. It will be an interesting, exciting and critical phase for the project – to show that a zero emissions masterplan can be implemented effectively throughout the commercial development.

Acknowledgements

We would like to thank Birmingham City Council for its decision to engage with WBCSD and for the excellent collaboration. We also take the opportunity to thank Arcadis, as the WBCSD project lead in Birmingham, for their strong guidance, technical input and engagement management, as well as the other participating companies, ENGIE, Schneider Electric, Toshiba and UPS for their expertise, insights and strong willingness to collaborate with the city and the other WBCSD Zero Emissions Cities business partners. Lastly, a special thank you to our local partner organization, the UK BCSD, for its help in guiding the process with their local knowledge, connecting the dots and providing valuable insights to the work.

This report has been coordinated and written by Andrew Waddelove, Principal Sustainability Consultant, at Arcadis, with input from the Birmingham City Council team members and the Zero Emissions Cities project partners listed below.

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Zero Emission Cities – Smithfield

Birmingham City Council (BCC) and the World Business Council for Sustainable Development (WBCSD) Zero Emission Cities (ZEC) team have identified the Smithfield development as the focus for a ZEC engagement. The Smithfield visioning document outlines the requirement for the development to 'meet high standards of sustainable design and construction that will be essential in creating an adaptable environment that will stand the test of time'. This vision is matched by the WBCSD in seeking to deliver the future urban environments we need.

This document sets out the proposed Sustainability Framework that will support Smithfield meet this vision. The Framework draws together a range of sustainability standards and examples of Best and Aspirational Practice that, if embedded, will deliver the sustainability aspirations of Smithfield. This is very much a 'blueprint' for the WBCSD ZEC vision of the delivery of a highly sustainable development and is drawn from the WBCSD and its member companies.

The framework also draws on insight and engagement from BCC staff. This input has been received through a series of workshops held with representatives of BCC to identify the suitable level of aspiration for Smithfield. Where possible we have identified local planning policy against targets but understand there is an emerging city plan that will shape the future sustainability policy of Birmingham.

This ZEC project is positioned to match the global ambition of the COP 21 Paris Climate Change Agreement, including reviewing how Smithfield could adopt the 5-year ratchet principle enshrined in the December 2015 global agreement. As part of this we have identified how the Sustainable Development Goals (SDG's) match the Key Performance Indicators developed for Smithfield. One of the objectives set by the SDGs is to "substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaption to climate change, resilience to disasters, and develop and implement holistic disaster risk management at all levels". This framework goes some way to responding to this challenge, setting a holistic approach to sustainability that will support the long term livability of the site and support Birmingham deliver its sustainability aspirations.

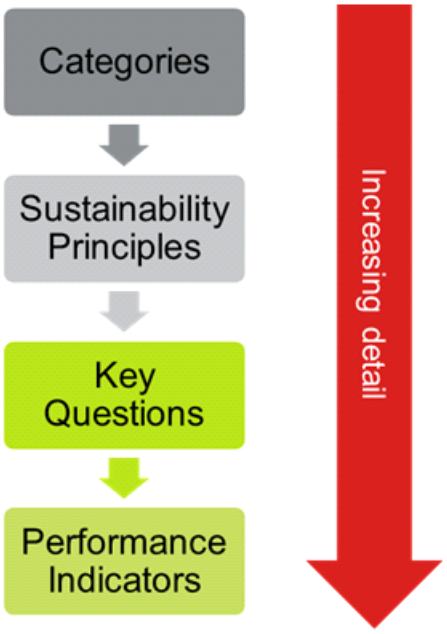
Based on the vision for Smithfield the development will need to include a range of measures designed to reduce energy and water consumption and use sustainable building materials. The development needs to be resilient to the potential impacts of climate change with the effective on-site management of energy and water. The development also requires that digital technology, and the provision of infrastructure and new technologies which enhance digital connectivity, will form a central part of the development plans. BCC also requires that the development be supported by suitable social and green infrastructure that is set within environments that reflect the character and history of the area. This needs to reflect Birmingham's position as an exemplar sustainable city, including its status as a Biophilic City. This will include the Natural Capital Planning Tool and the Birmingham Health Impact Assessment. Smithfield must also provide transport connectivity to Birmingham and beyond. Smithfield will be both a destination and a community that provides housing for workers across Birmingham and the wider region.

Although the focus of the ZEC project is on delivering Zero Emissions we recognise that the development must be based around a broader set of sustainability indictors including those relating to three core themes (Buildings, Energy and Mobility) identified in the ZEC plan. There is also recognition of the relative merits and interdependency of other sustainability ambitions (for example enhancing green infrastructure) on the ZEC goals. On this basis, the ZEC team has identified ten sustainability categories for Smithfield. Under each of these categories 'Sustainability Principles' outline an approach to delivering more sustainable outcomes. These principles are fundamental and should be subscribed to and upheld by all involved in the delivery of Smithfield to ensure that sustainability is integrated into the design of the development from the very start.

Structure of Framework

The framework for Smithfield is built on the following structure, based on Arcadis' own Sustainability Target Assessment Rating (STAR). Underpinning the Categories and Sustainability Principles are Key Questions. These have been developed under each of the categories and focus on sustainability

issues that are most relevant to the Smithfield development. These Key Questions should be responded to directly in the masterplan to understand the level of sustainability performance that the development will deliver and whether there is an opportunity for this to be improved.



Categories

The ZEC Framework assesses 10 Categories of sustainability. These are:

- Energy and Climate Action;
- Water;
- Waste;
- Buildings;
- Natural Capital;
- Transport and Accessibility
- Materials and Resources
- Community and Culture;
- Local Economy; and
- Health and Wellbeing.

Sustainability Principles

The following sets out the guiding sustainability principles that underpin the Smithfield development.

Energy and Climate Action

- **Deliver a zero carbon emissions development in line with the objectives of the WBCSD Zero Emissions Cities project**
- **Reduce vulnerability and risk through creating a development that is resilient to energy price fluctuation and the impacts of climate change**

An energy efficient / zero carbon development will be central to delivering the ZEC vison for Smithfield. The efficient supply of energy from low and zero carbon sources whilst reducing energy demand through sustainable building design and operation will enhance environmental performance and deliver significant operational cost savings. Designing a development that is able to adapt to the predicted impacts of climate change will reduce vulnerability to extreme weather and the need for future mitigation measures.

Water

- **Reduce potable water demand through the efficient use of water and wastewater**
- **Manage storm water run-off through incorporating appropriate Sustainable Drainage Systems (SuDS) to reduce the risk of flooding**

Water is a finite resource that is under increasing pressure. The average UK resident uses 150 litres of water per day. Taking into account all of our food and resources we consume each day the figure is around 3400 litres, enough to fill 42 baths. This level of consumption is unsustainable in the long term. Reducing consumption and finding alternatives can support cost reductions and reduce the burden on our water resources.

Waste

- **Minimise the generation of waste associated with demolition, excavation and construction**
- **Deliver a development that provides efficient systems for waste management during operation**
- **Promote materials and resource efficiency**

The efficient management of waste can deliver positive environmental and economic outcomes during both the construction and operation of the development. A progressive approach to waste infrastructure and management offers an opportunity to demonstrate thought leadership, whilst also achieving a return on investment. Understanding of The Waste Hierarchy and putting in place structures / mechanisms to reduce the creation of waste and promote recycling and re-use will support long term sustainability gains. The opportunity to use waste as an energy source should be exploited where appropriate and clearly contributes to the ZEC ambition. Opportunities for energy from waste plants and fuels as a waste bi-product should be considered.

Buildings

- **Deliver more sustainable buildings that deliver enhanced economic, social and environmental outcomes including lower operational costs**
- **Promote a high quality development incorporating a high quality public realm**
- **Utilise smart metering to support long term energy efficiency**

The buildings will be a physical embodiment of BCCs commitment to sustainability. The business case for green buildings is clear with growing evidence that green buildings deliver additional benefits including improved health, wellbeing and productivity. Green building rating schemes such as BREEAM provide a recognised standard to demonstrate sustainable design, promoting energy efficiency and sustainable architecture. Smithfield also needs to present a new destination in Birmingham. Promoting high quality architecture and urban design will provide an attractive place to live, work and play within the centre of Birmingham. This needs to recognise the socio-economic structures of Birmingham's population and their wants and needs.

Natural Capital

- **Protect and enhance natural capital and habitat connectivity to achieve a Net Positive Impact**
- **Support the development / enhancement of green infrastructure**
- **Promote ecosystem services and provide food growing space**

Natural Capital is emerging as a key sustainability theme with a growing number of organisations developing strategies to protect and enhance natural systems. A greater understanding of ecosystem services and the localised benefit this can bring is fuelling this development. Issues such as air and water quality can be improved through understanding local climatic conditions and putting in place measures to address these issues. Redevelopment of the site presents an opportunity for Smithfield to deliver positive change through the enhancement of natural capital and associated additional benefits such as storm-water management and health and wellbeing. This can be achieved through considering natural capital in the landscape plan and at a building level through integrated design features.

Transport and Accessibility

- **Promote and enable efficient, low carbon, low air quality emission and low congestion means of people and goods transport**
- **Promote accessibility to and within Smithfield**
- **Prioritise active transportation**

Establishing a well-connected accessible place with a welcoming pedestrian experience will be an important factor in creating a positive identity for Smithfield. Linking into the recently completed New Street Gateway, which provides a grand entrance and new public space on Station Street will galvanise the regeneration of its southern neighbourhoods in Southside and bring the station closer to Smithfield. Infrastructure will also need to reflect the urban context, reducing the impact of freight and delivery vehicles in the immediate vicinity of Smithfield and the wider impact these have on Birmingham.

Materials and Resources

- **Achieve a more sustainable use of materials and resources, considering embodied impacts, sourcing, conservation and re-use**
- **Undertake a whole life cost review to support long term cost efficiencies**

Establishing an early commitment to specify more sustainable construction materials and use resources more efficiently would allow Smithfield to demonstrate a best practice approach. The Olympic Delivery Authority for London 2012 showcased this approach, making it a requirement that only legal and sustainable timber could be used in the construction of the Olympic Park and Venues. As a result, the Olympic Park became the first construction project to gain joint FSC and PEFC certification.

Community and Culture

- **Deliver a development that benefits residents, business and local community and enhances the identity of Smithfield**

Creating a vibrant urban development that provides amenities for the future population and supports a sense of community will be a key element in enhancing social sustainability.

Adjacent to the western boundary of Smithfield is Southside, one of the City's most culturally diverse areas. The cluster of theatre, entertainment and leisure activities, including the Hippodrome Theatre, National Trust 'back-to-backs', Birmingham's Gay Village and Chinatown, create a lively cultural focus.

Local Economy

- **Support positive outcomes for the local economy and new opportunities for local businesses**
- **Promote the historical nature of the development integrating new space for existing businesses**
- **Promote training and skills development**
- **Promote Birmingham's position as a Science City and a Digital City and the role of creative industries**
- **Establish a digital environment that provides a unified approach to ensure that any development is future proofed, is sustainable and provides a better quality of life for citizens**

The development will be a catalyst for positive change in the local economy. This includes local job creation and opportunities for training and education during the construction phase whilst providing new opportunities and premises for businesses during operation. This needs to reflect the role of Birmingham in the national economy whilst promoting new space for existing businesses and new businesses looking to locate in Birmingham.

Digital technologies have been a major driving force in influencing and shaping industry and society in the last few years. Changes that are currently transforming our working, learning, leisure and community environments will need to be integrated into future developments. It is widely acknowledged that the deployment of digital technologies will be necessary for the operation, design and monitoring of buildings, the public realm and cities in order for it to improve its sustainability, deliver planned outputs and outcomes, and enable better citizen's interaction and integration within developments.

Health and Well-being

- **Deliver amenities that encourage active and social lifestyles and promote health and wellbeing**

The design and layout of the development as well as the detailed design of individual buildings can positively impact on health. Amenities that encourage active and social lifestyles and promote health and wellbeing will deliver positive social outcomes for the future population. This also needs to be reflected in the public realm, promoting green infrastructure as active space. Linked to natural capital and the provision of green infrastructure creating active outdoor space will support community health and well-being.

Key Questions

The Key Questions build on the Sustainability and ZEC principles:

Energy and Climate Action

1.01 – Has the masterplan been designed to be a zero emissions development?

1.02 – Has the masterplan been designed to reduce energy consumption?

1.03 – Has the development been designed to supply energy efficiently?

1.04 – Has the masterplan been designed to optimise the use of renewable energy?

1.05 – Will the design of the development consider and respond to the predicted impacts of climate change?

1.06 – Will the development incorporate measures to avoid overheating and reduce the urban heat island effect?

1.07 – Will the development result in an increase in urban greening?

1.08 – How will the masterplan address long term sustainable management of the development?

Water

2.01 – Will the development be designed to enable the efficient use of potable water in residential buildings?

2.02 – Will the development be designed to enable the efficient use of potable water in non-residential buildings?

2.03 – Has the development been designed to incorporate rainwater / greywater harvesting?

2.04 – What measures have been taken to support the cleaning of Birmingham's waterways?

2.05 – Does the development incorporate leak detection?

2.06 – To what extent has the development been designed to attenuate surface water runoff?

Waste

3.01 – Is there a commitment to minimise the generation of construction, excavation and demolition (CE&D) waste and maximise opportunities for it to be reused and recycled?

3.02 – How will the design of the development support efficient systems for operational waste management?

3.03 – Have structures and mechanisms been put in place to reduce waste generation, maximising re-use and recycling?

3.04 – Are measures in place to optimise on site waste re-use / reduction with the potential for energy from waste solutions?

Buildings

4.01 – Have microclimatic factors influenced the location of building uses and orientation and design of buildings and public realm?

4.02 – Will the non-residential buildings within the masterplan deliver high levels of sustainability?

4.03 – Will the residential buildings within the masterplan deliver high levels of sustainability?

4.04 – Does the development comprise of a range of housing types, including mixed tenure, to support a diverse community?

4.05 – Does the development have the potential to support retrofitting of existing buildings?

Natural Capital

5.01 – Will the development deliver an increase in natural capital and habitat connectivity?

5.02 – Will the development deliver green roofs and walls that maximise the opportunity for enhancing natural capital?

5.03 – Will the landscape plan set out to enhance natural capital?

5.04 – Does the landscape strategy promote water efficiency?

5.05 - Does the landscape strategy promote biodiversity?

Transport and Accessibility

6.01 – To what extent will the masterplan prioritise pedestrians and encourage pedestrian movement?

6.02 – To what extent will the masterplan encourage cycling as a means of transport?

6.03 – Will the masterplan incorporate cycle parking and facilities that encourage cycling?

6.04 – Will the masterplan promote access to public transport?

6.05 – Does the masterplan incorporate infrastructure to support electric, or alternative fuel, vehicles?

6.06 – Will the masterplan deliver an accessible and inclusive environment?

6.07 – What measures will be taken to reduce reliance on private cars?

6.08 – What measures will be taken to reduce congestion within and around the boundaries of the development?

6.09 – To encourage more frequent use of public transport during the entire year, by having waiting areas which are considered safe and out of the weather.

6.10 – Does the masterplan encourage the use of logistics providers with a demonstrably good sustainability record?

6.11 - What measures will be taken beyond those in 6.10 to reduce the contribution of goods deliveries to carbon and air quality emissions?

6.12 - What measures will be taken beyond those in 6.10 to reduce the contribution of goods deliveries to congestion?

Materials and Resources

7.01 – To what extent will the development promote the use of materials with a low embodied environmental impact?

7.02 – To what extent will the development promote the use of materials that are responsibly sourced?

7.03 – Will the masterplan promote the efficient use of land through developing brownfield land and remediating contaminated land?

7.04 – Does the masterplan incorporate local / regional materials?

7.05 – Will the development undertake an embodied carbon assessment?

7.06 – To provide easy access to site service and communications infrastructure, with minimal requirement disruption and need for reconstruction, and allowing for future growth in services.

Community and Culture

8.01 – To what extent will consultation take place with local communities and key stakeholders at the pre-application stage?

8.02 – Does the masterplan make adequate provision for the day to day shopping and service needs of future, workers, residents and other users of the development?

8.03 – Does the masterplan seek to design out crime and ensure community safety?

8.04 – Does the masterplan contribute to the provision of necessary community meeting space for the future population and local community?

8.05 – Will partners support the education of residents as to the sustainability features of the new development?

8.06 – What measures will be taken to reduce the impact of construction on local communities?

8.07 – Does the public realm incorporate local art / sculptures?

8.08 – To ensure that heritage or archaeologically important features are conserved or preserved.

Local Economy

9.01 – Will the development improve access to and increase numbers of work experience, trainee and apprenticeship opportunities?

9.02 – Does the masterplan incorporate a range of business premises with a range of sizes and tenancy agreements to contribute to Birmingham's economy?

9.03 – Does the development support agile working?

9.04 – To attract inward investment from businesses and organisations from outside the immediate area to increase economic well-being.

9.05 - Will the development enable a future proofed digital infrastructure?

9.06 - Is the development able to adapt and measure its impacts and outcomes over its lifetime?

9.07 - Can the development be modelled using 3D visualisation and integrated digital modelling techniques?

Health and Well-being

10.01 – Will the development result in improved health care facilities for the local area?

10.02 – Will the development result in improved leisure, recreation, sport and fitness facilities for the local area?

10.03 – How does the masterplan address air quality and support Birmingham's Clean Air Zone?

10.04 – To what extent has the impact of noise been considered in the masterplan?

10.05 – Will lighting design reduce the impact that light pollution from the development has on surrounding communities?

Performance Indicators

For each question, there are three levels of sustainability performance to establish Performance Indicators. These are:

- **Compliant / Standard Practice:** representing the minimum level required to meet relevant policy requirements and / or recognised industry guidance.
- **Best Practice:** representing current best practice in sustainability.
- **Aspirational**: representing leading edge sustainability.

It should be noted that the standards contained within this Framework are intended to relate solely to the masterplan for Smithfield. Operational and Management issues will need to be addressed separately to support the long term low carbon aspirations of the development. This will include city based reporting metrics that will support BCC convey the sustainability performance of Smithfield. These could include:

- Air pollution / Air quality;
- Recycling / waste performance (operational waste);
- Average hours worked by residents;
- Average commuting time;
- Average salary;
- Average property rental price as a percentage of average income.

Sustainability Targets

The ZEC Project Team held a workshop with key BCC staff on 21st September 2016 to identify the sustainability KPI's that they should target. This is based on what they felt was feasible at the Smithfield site but also their ambitions as the local Council.

The 'Target Rating' is identified by colouring the relevant KPI in 'Green'.

At present BCC are targeting:

- **Compliant / Standard Practice:** 9 targeted
- **Best Practice:** 32 targeted
- **Aspirational:** 26 targeted.

Link to Sustainable Development Goals

The 17 Sustainable Development Goals (SDGs) define global sustainable development priorities and aspirations for 2030 and seek to mobilize global efforts around a common set of goals and targets. The SDGs call for worldwide action among governments, business and civil society to end poverty and create a life of dignity and opportunity for all, within the boundaries of the planet.

Between 2000 and 2015, the Millennium Development Goals (MDGs) provided an important development framework and achieved success in a number of areas such as reducing poverty and improving health and education in developing countries. The Sustainable Development Goals (SDGs) succeed the MDGs, expanding the challenges that must be addressed to eliminate poverty and embracing a wide range of inter-connected topics across the economic, social and environmental dimensions of sustainable development.

The SDGs were born out of what is arguably the most inclusive process in the history of the United Nations, reflecting substantive input from all sectors of society and all parts of the world. The goals are universally applicable in developing and developed countries alike with Governments expected to translate them into national action plans, policies and initiatives, reflecting the different realities and capacities their countries

possess.

While they primarily target governments, the SDGs are designed to rally a wide range of organizations, and shape priorities and aspirations for sustainable development efforts around a common framework. Most importantly, the SDGs recognize the key role that business can and must play in achieving them.

Where relevant within the Framework we have identified the relevant SDG Indicators that link to the KPI. This will help BCC identify how they are addressing the development priorities and aspirations for 2030.

Cost Benefit Analysis

In support of the delivery of the framework we have undertaken a high level cost analysis of the KPI's. This draws on the collective expertise and insight of the ZEC members to support BCC embed sustainability in discussions around the deliverability of Smithfield.

Within each section, a whole life value assessment has been applied to each question, providing insight into the relative benefit and costs of implementation. This takes a high level look at the cost implications of obtaining the desired level for each performance indicator and provides a commentary on the potential cost of meeting 'Compliant Practice' and the potential cost uplift in order to meet 'Best Practice'. We have also provided commentary as to the potential value that this would bring over the lifetime of the development. This is based on a high level summary of the information available to date.

For each question a table is provided that highlights whether the whole life value benefit for moving beyond 'Compliant / Standard Practice' to 'Best Practice' will be predominantly environmental, social and/or economic. For example:

Whole Life Value		
Economic		
Social		
Environmental		

A more in depth Cost Benefit Analysis (CBA) has been applied to the following sections: **Energy and Climate Action; Water; Buildings; Natural Capital and Transport and Accessibility.** As the development is still at the master plan stage, a range of assumptions have been made and the cost benefit analysis does not look at how the various technologies can be combined to provide the overall scheme design.

The Energy and Climate Action CBA provides a range of possible options that would fit across all key questions that apply. The Building and Transport and Accessibility CBA provides high level cost options for the relevant performance indicators. The Natural Capital CBA aims to provide a better understanding of the costs and benefits of natural capital and the inclusion of natural capital design solutions, namely green roofs rain gardens and pocket parks, to encourage their wider uptake and provide a financial framework upon which the ZEC principles can be implemented. Currently their implementation remains below potential, due to lack of demonstration and awareness of the multiple benefits they provide. One reason is that most benefits are difficult to measure and not directly marketable. This study has attempted to fill the

gaps by identifying key natural capital benefits and include them in a more comprehensive cost benefit analysis.

Please note that this assessment is high level and is provided as guidance only. We have also not provided an assessment of the following sections:

- Materials and Resources;
- Community and Culture;
- Local Economy;
- Health and Wellbeing.

This is due to the level of detail currently available in the masterplan.

WBCSD Role in Implementation

The WBCSD will play a key role in the implementation of the Smithfield Framework. The approach of the WBCSD is to work with cities to increase sustainability performance. This isn't about comparing cities but creating a community of cities and businesses working together to improve sustainability performance, sharing best practice to deliver sustainable outcomes. To this end the WBCSD will work with BCC to ensure the KPI's are being adopted, and the member companies will support their delivery.

This approach is focused on optimising engagement opportunities between the public and private sector and supporting the identification of opportunities for successful delivery. City policies that focus on sustainable strategies will drive economic growth, social development and environmental sustainability. This will require the public and private sector to work collaboratively and the WBCSD can support this.

Helping cities to realise these strategies, translating vision into action, is at the core of the Framework contained within this document and is a fundamental value of the WBCSD.

The following Sections provide the detail for the Framework for Smithfield.

Please Note: *all web links correct at the time of writing.*

1. Energy and Climate Action

The built environment is a significant contributor to carbon dioxide emissions in the UK, with buildings accounting for 37% of total greenhouse gas emissions. There is significant opportunity for the emissions associated with new development to be mitigated through careful design and operation. Current and upcoming National and Local Government requirements for low and zero carbon developments are driving new development to reduce carbon dioxide emissions. The Climate Change Act in the UK sets legally binding greenhouse gas emission reductions targets of at least 80% by 2050 (with an interim target of 26% by 2020) against a 1990 baseline. If this target is to be achieved transformational action is required.

In addition to climate change mitigation it is increasingly recognised that action is required to ensure we can adapt to the predicted impacts of climate change as effectively as possible.

1.01 - Has the masterplan been designed to be a zero emissions development?

To reduce the carbon emissions associated with new development, a target of 35% improvement beyond Part L of the Building Regulations 2013 is a realistic baseline. This is an ambitious and challenging target and is broadly equivalent to the BREEAM 'Outstanding' requirement for reduction of emissions. To achieve this target energy efficiency would need to be central to the design of the development from the outset. Each building would require highly efficient building fabric to significantly limit heat gains and losses and limit air permeability. In addition, efficient fixed building services would be required and the effects of solar gains in summer would need to be limited through building orientation and design.

BCC's own aim is to reduce emissions by 60% against a 1990 baseline by 2026, based on 1990 figures.

This target is set to increase over time:

Year	Improvement on 2013 Building Regulations (For non-domestic buildings)
2013 – 2016	35%
2016 – 2019	As per building regulations requirements
2019 - 2031	Zero carbon

Compliant / Standard Practice

ALL buildings within the development are designed to reduce their emissions by 35% against Part L 2013.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- file:///C:/Users/WaddeloveA/Downloads/48430Technical_Paper_1_-_Report_on_Birmingham's_CO2_Emissions_Target_Baseline_Final_07032013.pdf
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1,
  - Core Strategy Policy TP5
- http://www.birmingham.gov.uk/plan2031/evidencebase
  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
  - Carbon Plan Analysis (2013)
  - Green Commission Vision Statement (2013)

	○ Climate Change Adaptation Action Plan 2012+ (2012)
Best Practice ALL buildings within the development are designed to reduce their emissions by 70% against Part L 2013.	**Relevant Policy / Guidance** http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper ○ Core Strategy Policy TP3 ○ Core Strategy Policy TP4 http://www.birmingham.gov.uk/plan2031/evidencebase ○ Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013) ○ Carbon Plan Analysis (2013) ○ Green Commission Vision Statement (2013) ○ Climate Change Adaptation Action Plan 2012+ (2012) (http://www.bebirmingham.org.uk/documents/Birmingham_Total_Waste_Strategy_Final_Report_24.11.10.pdf?phpMyAdmin=b5998cc58dff68a4b03a480ef59038da) - Waste Strategy file:///C:/Users/WaddeloveA/Downloads/48430Technical_Paper_1_-_Report_on_Birmingham's_CO2_Emissions_Target_Baseline_Final_07032013.pdf *In order to achieve its ambitious energy targets, France issued the RT 2012 thermal regulations which requires a primary energy consumption of 40-65 kWh/m2y for new residential buildings and 70-110 kWh/m2y for new non-residential buildings, depending on building location. For existing buildings, residential buildings should have a maximum primary energy consumption of 80 kWh/m2y while non-residential buildings should be 40% more efficient. Focus is given on making the heating, domestic hot water, lighting, cooling, and auxiliary systems of buildings more energy efficient. Making buildings more energy efficient is one of the ways by which CO_2 emissions are reduced.* *The urban redevelopment project in Lyon, France which began in 2003 and will run until 2025, implements the more stringent high environmental quality (HQE) specifications. La Haute Qualité Environnementale or HQE is a standard for green buildings in France that take into account various environmental issues in the*

	design and construction of a building. This leads to increased renewable energy use (wood-fired boilers, solar water heaters, and panels) and buildings using less energy than required by the thermal regulations. *Recognized as a WWF 'Sustainable Neighbourhood', the Lyon urban redevelopment project aims to achieve a zero-carbon target. With a plan that consists of 1 million m2 of built space (net floor area) that meets high environmental requirements, the rollout of a district heating network, the eco-refurbishment of the old quarter, and the raising of resident awareness, it is estimated that local buildings will emit no more greenhouse gases in 2020 than they did in 2000.*

Aspirational
ALL buildings within the development are classified as Zero Carbon.
	Relevant Policy / Guidance
	• http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
	  ○ Core Strategy Policy TP1
	  ○ Core Strategy Policy TP4
	• http://www.birmingham.gov.uk/plan2031/evidencebase
	  ○ Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
	  ○ Carbon Plan Analysis (2013)
	  ○ Green Commission Vision Statement (2013)
	  ○ Waste Strategy Climate
	  ○ Change Adaptation Action Plan 2012+ (2012)
	• (http://www.bebirmingham.org.uk/documents/Birmingham_Total_Waste_Strategy_Final_Report_24.11.10.pdf?phpMyAdmin=b5998cc58dff68a4b03a480ef59038da)
	  ○ Waste Strategy
	• file:///C:/Users/WaddeloveA/Downloads/48430Technical_Paper_1_-_Report_on_Birmingham's_CO2_Emissions_Target_Baseline_Final_07032013.pdf

Who is accountable for delivering this?

- Richard Rees / Jackie Homan
- Birmingham Property Services

Link to SDG's:

7. Ensure access to affordable, reliable, sustainable and modern energy for all

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Whole Life Value Assessment

What are the cost implications of compliance? Achieving a 35% improvement beyond Part L of the Building Regulations 2013 has the potential to increase the capital cost of development through additional energy infrastructure. Increased building specification (for example, higher U-Values of building fabric and higher specification of air tightness leading to increased build time due to building detailing / overcoming thermal bridging) may also lead to more time taken in construction leading to increased cost. If a 35% improvement beyond Part L is not achieved and a financial contribution to the local carbon offset fund is required this would also represent a cost. The capital and operational cost implications of achieving a 35% improvement beyond Part L should be considered against the cost of making a financial contribution to the local carbon offset fund as required.
What are the cost implications of moving beyond compliance? Whilst technically feasible to meet a 35% improvement beyond Part L within the framework of the energy hierarchy (without a financial contribution to the local carbon off-set fund) it may not be commercially attractive to the developer due to the increased capital cost of development result of additional energy infrastructure.
What is the value of moving beyond compliance? Reducing energy demand can lead to lower operational costs. It is not possible to state at this time what the operational requirement will be over the lifetime of the development but there is considerable financial benefit to reducing energy demand or utilising a local energy centre to serve the development. Moving beyond compliance would attract higher capital cost but could contribute to lower operating costs and so the feasibility of this should be explored through the energy strategy. The site has the potential to be future proofed against future energy price fluctuations by having its own energy generation infrastructure.
It is considered that the whole life value benefit to the City for moving beyond compliance for minimising carbon dioxide emissions will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

1.02 - Has the masterplan been designed to reduce energy consumption?

Reducing energy consumption through sustainable design principles that reduce energy demand can support a reduction in carbon emissions and lower operational cost. Utilising appropriate passive design measures can reduce energy consumption if replacing / reducing the need for mechanical systems. Due to the location of the site, its context and constraints, natural ventilation is expected to be unsuitable; however other passive design measures may be more appropriate such as solar heating and daylighting.

Compliant / Standard Practice

The masterplan minimises carbon dioxide emissions through the implementation of the energy hierarchy:

- Be lean: use less energy
  adopting sustainable design principles to reduce energy demand
- Be clean: supply energy efficiently
  prioritising decentralised energy (e.g. district heating)
- Be green: use renewable energy
  installing on-site renewable energy systems

The developer has made a commitment to undertake an energy demand assessment demonstrating how the target for carbon dioxide emissions reduction will be met within the framework of the energy hierarchy.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1
  - Core Strategy Policy TP4
  - Core Strategy Policy TP14
  - Core Strategy Policy TP15
- http://www.birmingham.gov.uk/plan2031/evidencebase
  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
  - Carbon Plan Analysis (2013)
  - Green Commission Vision Statement (2013)
- http://www.bebirmingham.org.uk/documents/Birmingham_Total_Waste_Strategy_Final_Report_24.11.10.pdf?phpMyAdmin=b5998cc58dff68a4b03a480ef59038da
  - Waste Strategy
- http://www.birmingham.gov.uk/cs/Satellite/bigcityplan?packedargs=website%3D4&rendermode=live

Best Practice

The masterplan design has taken consideration of passive design measures to maximise the potential for natural systems over mechanical building services where appropriate and possible (including heating, ventilation, cooling and lighting).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1
  - Core Strategy Policy TP4

This includes optimising building form and orientation to optimise natural heating and cooling. All buildings should achieve Part L 2013 Building Regulations requirements through design and energy efficiency alone.	- Core Strategy Policy TP5 • http://www.birmingham.gov.uk/plan2031/evidencebase - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013) - Carbon Plan Analysis (2013) • Green Commission Vision Statement (2013)
Aspirational The development is a net exporter of energy. This is identified through a detailed Business Plan that delivers long term financed solutions to the delivery of energy infrastructure. Opportunities for BCC to utilise profit generated is identified for retrofitting poorly performing buildings within Birmingham.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper ○ Core Strategy Policy TP4
Who is accountable for delivering this? • Richard Rees / Jackie Homan	
Link to SDG's: **7. Ensure access to affordable, reliable, sustainable and modern energy for all** **7.1** By 2030, ensure universal access to affordable, reliable and modern energy services **7.2** By 2030, increase substantially the share of renewable energy in the global energy mix **7.3** By 2030, double the global rate of improvement in energy efficiency **7.a** By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology **7.b** By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	

Whole Life Value Assessment

What are the cost implications of compliance? The energy hierarchy places a focus on low cost solutions to reduce energy demand, utilising natural systems and sustainable design solutions to reduce the need for mechanical systems. Reducing energy consumption by removing the need for mechanical systems has the potential to reduce cost if considered from the earliest stages of building design. The specification of a district energy system will attract higher capital costs but is the minimum required for the site to gain planning permission. The extent to which the energy strategy utilises renewable systems is limited with the focus on a CHP system reducing the need for PV or wind systems.
What are the cost implications of moving beyond compliance? The final solution for the development is likely to be the specification of a district energy system which will be a significant upfront capital cost but that which will contribute to lower operating costs / energy costs. The extent to which the buildings are designed to be low energy will directly correlate to the size requirement of the energy centre and their cost of operation.
What is the value of moving beyond compliance? Passive buildings reduce the need for mechanical systems by utilising daylight and natural systems to ventilate / light / heat / cool buildings. The cost of design solutions is negligible, although larger atriums for ventilation and floor plate constraints for daylighting, place limits on design outcomes which may reduce the lettable floor area or price paid for such spaces. Recent evidence has demonstrated the health and productivity benefits of naturally ventilated and day lit buildings. This also reduces the operational cost of the building and can contribute to significant lifetime savings by reducing costs associated with building users. It is considered that the whole life value benefit to the Birmingham Smithfield for moving beyond compliance to reduce energy consumption will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

1.03 - Has the development been designed to supply energy efficiently?

In order to supply energy efficiently decentralised energy (e.g. district heating) at the development and area wide level.

Compliant / Standard Practice

The masterplan is supported by an Energy Strategy which assesses the potential to:

- Connect to an existing district heating or cooling network;
- Expand an existing district heating or cooling network, and connect to it; or
- Establish a site wide network, and enable the connection of existing buildings in the vicinity of the development.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1
  - Core Strategy Policy TP4
- http://www.birmingham.gov.uk/plan2031/evidencebase
  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
  - Carbon Plan Analysis (2013)
  - Green Commission Vision Statement (2013)
  - Climate Change Adaptation Action Plan 2012+ (2012)

Best Practice

The Energy Strategy has explored the potential to maximise long term carbon dioxide savings by feeding the decentralised energy network with low or zero carbon hot and where required, cold water. This includes the potential to connect to the Tyseley Incinerator for waste heat.

(Options to be explored for suitability may include zero carbon hot water generated from biomass, biogas or waste fired boilers or low carbon hot water from highly efficient gas fired CHP. If required, cold water may be generated from highly efficient CHP plant combined with an absorption chiller (tri-generation)).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1
  - Core Strategy Policy TP4
- http://www.birmingham.gov.uk/plan2031/evidencebase
  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
  - Carbon Plan Analysis (2013)
  - Green Commission Vision Statement (2013)
  - Climate Change Adaptation Action Plan 2012+ (2012)

Aspirational	Relevant Policy / Guidance

The energy strategy supports innovative new technologies that support a reduction in localised air and noise pollution, including the potential for building level Hydrogen Fuel Cells.	• http://www.landsecurities.com/media/corporate-blog?id=133
	• http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
	  - Core Strategy Policy TP1
	  - Core Strategy Policy TP4
	• http://www.birmingham.gov.uk/plan2031/evidencebase
	  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
	  - Carbon Plan Analysis (2013)
	  - Green Commission Vision Statement (2013)
	  - Climate Change Adaptation Action Plan 2012+ (2012)

Who is accountable for delivering this?

- Richard Rees / Jackie Homan / Sylvia Broadly

Link to SDG's:

7. Ensure access to affordable, reliable, sustainable and modern energy for all

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Whole Life Value Assessment

What are the cost implications of compliance? The energy strategy assumes that Birmingham Smithfield will have its own energy centre(s). There is a significant capital cost for specifying an energy centre on site and the associated space this would require. If the development were to specify their own system to serve their own site this needs to be supported by a business case that demonstrates the whole life value of this. Within this context, Birmingham Smithfield has the potential to become a net-exporter of energy, serving local developments. This has the potential to create revenue for the site but could lead to the relative over specification of energy infrastructure for the site and could lead to a higher capital cost than other solutions.
What are the cost implications of moving beyond compliance? As above, being a net-exporter of energy has the potential to create income for Birmingham Smithfield but this could incur additional capital cost, both in terms of the system and supporting infrastructure. Where this extends beyond energy to incorporate hot and cold water there will be additional costs from the technology specified and the infrastructure to support its distribution. The development may also consider appointing an external body to install and operate an energy centre where they are a major client. This will reduce the initial cost, maintenance cost and risk to the project but may lead to higher lifetime cost through fees paid to the external provider.
What is the value of moving beyond compliance? Energy infrastructure that incorporates central hot and cold water reduces reliance on utilities providers. This has the potential to contribute to operational cost savings and reduce the need for more localised systems at the individual building or home level. This could generate revenue for the development and so whilst representing a significant capital cost over the lifetime such systems could be revenue generating for the site. This also potentially future proofs the development against the full impact of utility price fluctuations but will require operational maintenance to ensure the quality of supply is maintained. It must be noted that complex energy systems are not necessarily user friendly and can be counterproductive with the potential to increase cost where the system is not commissioned correctly or where user knowledge leads to inefficient operation.
It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to supply energy efficiently will be predominantly economic and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

1.04 - Has the masterplan been designed to optimise the use of renewable energy?	
The most suitable on site renewable energy should be used to further reduce carbon dioxide emissions once opportunities to use less energy ('Be lean') and supply energy efficiently ('Be clean') have been fully explored in line with the energy hierarchy.	

Compliant / Standard Practice
The Energy Strategy has identified how the development will incorporate appropriate renewable energy technologies to minimise overall carbon dioxide emissions.
	Relevant Policy / Guidance
	• http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
	  ○ Core Strategy Policy TP4
	• http://www.birmingham.gov.uk/plan2031/evidencebase
	  - Technical Paper 1 – Carbon Dioxide Emissions Reduction Target Baseline (2013)
	• Carbon Plan Analysis (2013)
	• Promoting and supporting the use of low and zero carbon energy sources and technologies (Policy TP4).
	• Promoting the use of CHP schemes and district heating (Policy TP4).
	• Encouraging the use of waste as a resource (Policy TP13).

Best Practice The Energy Strategy optimises the use of renewable energy technologies based on a whole life value approach.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Aspirational The development incorporates design features that allow for the inclusion of future renewables. This includes the potential to include PV panels / alternative renewable technologies on structures not currently utilised.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase • http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper • Core Strategy Policy TP4

Who is accountable for delivering this?

- Richard Rees / Jackie Homan

Link to SDG's:

7. Ensure access to affordable, reliable, sustainable and modern energy for all

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

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7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Whole Life Value Assessment

What are the cost implications of compliance? The planning requirements for the sites energy demand are considered stretch targets. Finding a solution that is both technically feasible and commercially viable is a development necessity. Whether this strategy utilises renewable technologies will impact its relative cost.
From a cost perspective the potential installation of renewable systems needs to consider:

- Capital cost;
- The potential for savings in operational costs;
- Maintenance (and access);
- Replacement of part or whole of the system where this is shorter than the buildings' operational life.

What are the cost implications of moving beyond compliance? The specification of renewables where these are not required within the energy strategy would represent an additional capital cost. However, these systems have demonstrable paybacks and may represent a cost effective option over their operational lifecycle when incorporated within the energy strategy for the development.
What is the value of moving beyond compliance? Renewable energy systems are a visual representation of a buildings sustainability credentials. As such they offer the potential to contribute to user perception of the quality of the development's built environment. In addition, as they utilise natural systems, they have the potential to create a low or cost positive source of energy within the development. This may offset some of the cost of a district energy scheme. Where the specified renewable energy technology does not meet the stated efficiency / electrical output some additional energy cost may occur where the shortfall from renewables is met by other energy sources. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to optimise the use of renewable energy will be predominantly environmental but would also provide an economic benefit.

Whole Life Value		
Economic		
Social		
Environmental		

1.05 - Will the design of the development consider and respond to the predicted impacts of climate change?

The predicted impacts of climate change include warmer wetter winters, hotter drier summers and more extreme weather events. These predicted impacts will influence a number of issues relevant to the built environment including thermal comfort, storm water management, water conservation and durability of materials. The opportunity to address these issues through creating a development that is adaptable to the predicted impacts of climate change is greatest and most cost effective during design.

Compliant / Standard Practice

The design of the development is informed by CIBSE Design for Future Climate guidance to address overheating and issues relating to flooding, drainage, water conservation and material durability.

Relevant Policy / Guidance

- CIBSE Design for future climate: case studies (2014)
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP6
- http://www.birmingham.gov.uk/plan2031/evidencebase
  - Strategic Flood Risk Assessment Level 1 (2012)
- Strategic Flood Risk Assessment Level 2 (2012)

Best Practice

The development has incorporated a long term climate change mitigation plan that reviews building temperatures, linked to Post Occupancy Evaluation, to support long term building level comfort and protect the development and its users against projected climatic extremes.

Relevant Policy / Guidance

- CIBSE Design for future climate: case studies (2014)

Aspirational

The design of public spaces includes design measures specifically to mitigate the impact of future climate change. This includes reducing the effect of storm water and increased temperature extremes.

Relevant Policy / Guidance

- CIBSE Design for future climate: case studies (2014)

Who is accountable for delivering this?

- Richard Rees / Jackie Homan
- Clive Skidmore / Clive Wright

Link to SDG's:

9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Whole Life Value Assessment

What are the cost implications of compliance? An adaptation strategy requires engineered solutions to overcome the potential impacts of climate change. This will represent an additional capital cost to the site where these represent a requirement to include additional design measures or engineered solutions.
What are the cost implications of moving beyond compliance? Moving beyond compliance may require additional engineering and design solutions to overcome potential local changes in climate, meaning potential further cost uplift. Not responding to these identified risks may mean additional energy costs are incurred or physical alterations to buildings is required in future to overcome impacts. This may affect building insurance where buildings are damaged as a consequence of climate change, cost of repair and loss of earnings for commercial units. If this does occur then it can be anticipated that this has the potential to become a regular occurrence, causing disruption to the development and site users and potentially impacting operations. This may have a negative impact on user perception of the site.
What is the value of moving beyond compliance? The value of addressing future climate impacts will not be realised until these effects are felt. In broad terms higher temperatures will place a higher energy load on buildings for cooling, rainfall events will require flood protection and higher building envelope specification and increased storm events will require local solutions to reduce impacts on buildings and public spaces. The cost of disruption caused, potential damage to buildings and retrofitting solutions to mitigate these potential impacts is difficult to quantify, but retrofitted solutions are considerably more expensive than solutions that are designed in from the earliest building design stages. This includes façade treatment and reducing the risk of localised flooding. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to the impacts.

Whole Life Value		
Economic		
Social		
Environmental		

1.06 - Will the development incorporate measures to avoid overheating and reduce the urban heat island effect?

The urban heat island effect refers to a localised increase in temperature as a result of urban areas storing and reradiating heat from the sun. Heat generated by energy usage is a secondary contributor. The urban heat island effect can have several detrimental effects including negative effects on the health and wellbeing of urban residents. Increased temperatures can result in an additional cooling requirement to provide thermal comfort to building users resulting in increased energy demand and cost. Addressing urban heat island projections and responding with design measures that manage the associated risks will support the long term sustainability of development.

Compliant / Standard Practice

The development will incorporate measures in line with the cooling hierarchy:

- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation;
- Active cooling systems (ensuring they are the lowest carbon options).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP1
  - Core Strategy Policy TP2
- Carbon Plan Analysis (2013)
- Technical Paper 1 - Carbon Dioxide Emissions Reduction Target Baseline (2013)
- Technical Paper 2 - Impact of National Policy and Programmes on Birmingham's Carbon Dioxide Emissions to 2027 (2013)

Best Practice

Compliant / Standard Practice PLUS:

Performance against future climate projections is reported in the energy strategy and mechanical design reports. These projections are taken into account to reduce vulnerability and risk.

Relevant Policy / Guidance

- UKCIP - http://www.ukcip.org.uk/

Aspirational

The masterplan takes account of the evidence of impacts of climate change on the site and demonstrates in the design plans how the

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

risks will be reduced through the use of design strategies that minimise the need for M&E systems.	

Who is accountable for delivering this?

- Richard Rees / Jackie Homan
- Nick Grayson / Simon Dellahunty-Forrest

Link to SDG's:

13. Take urgent action to combat climate change and its impacts

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 Integrate climate change measures into national policies, strategies and planning

Whole Life Value Assessment

What are the cost implications of compliance? Reducing internal heat gain reduces the operation cost of a building by reducing the need to provide additional cooling. Dependent on the solution some elements will require additional costs both in implementation and operation (i.e. increase in mechanical ventilation). In addition, external design features and façade / building envelope treatment has the potential to reduce heat gain in the public realm but may require additional investment.
What are the cost implications of moving beyond compliance? Taking account of future climate projections will lead to additional costs in understanding how best to future proof the development. This will lead to the relative specification of higher cost systems that take account of these potential scenarios.
What is the value of moving beyond compliance? The value of future proofing the development is relatively intangible where the impacts of climate change are yet to be felt. There is however broad consensus that the UK will experience longer, hotter summers and increased storm events. Responding to these risks require a range of future proofing measures that in the medium to long term have the potential to reduce maintenance costs and the cost of replacing building / site features. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to reduce the urban heat island effect will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

1.07 - Will the development result in an increase in urban greening?

Urban greening is strongly promoted by Birmingham and can enhance the ability of an urban area to adapt to climate change. This is achieved through reducing temperatures via cooling through evapotranspiration, storing and reradiating less heat than built surfaces and through direct shading. Urban greening also provides additional multi-functional benefits in an urban environment including reducing air pollution and noise, enhancing health and well-being and promoting natural capital. Urban greening through measures such as green roofs and soft landscaping can also contribute to effective storm water management and can be considered as part of a SuDS Strategy.

Compliant / Standard Practice

The development has an integrated approach to green infrastructure that results in all residents should have access within 400m, (5 to 10 minutes' walk) to an area of publicly accessible open space which should have grass and trees and be at least 0.2 ha in size. Similarly, there should be children's play facilities within 400m of all residents.

Relevant Policy / Guidance

- Birmingham Natural Capital Tool
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP7
  - Core Strategy Policy TP8
  - Core Strategy Policy TP9
  - Core Strategy Policy TP10
- Green Living Spaces Plan (2013)
- Public Open Space in New Residential Development SPD (2007)

Best Practice

The masterplan will integrate multifunctional green infrastructure to contribute to urban greening and enhance the ability of the development to adapt to climate change. Multifunctional green infrastructure may encompass tree planting, green roofs and walls and soft landscaping.

Urban greening will prioritise native and adaptive species and support the objectives and targets of Biodiversity Action Plans (BAPs) / Birmingham Natural Capital Protocol relevant to the site.

Relevant Policy / Guidance

- Birmingham Natural Capital Tool
- CIRIA 2011 Delivering biodiversity through green infrastructure
- UKGBC 2015 Demystifying green infrastructure
- http://livingroofs.org/
- http://www.greenroofguide.co.uk/

Aspirational

The development has an integrated approach to green infrastructure that results in all residents living within 300m of an area of publicly accessible open space which should have grass and trees and be at least 0.2 ha in size.

Relevant Policy / Guidance

- Birmingham Natural Capital Tool
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
  - Core Strategy Policy TP7
  - Core Strategy Policy TP8
  - Core Strategy Policy TP9
  - Core Strategy Policy TP10
- Green Living Spaces Plan (2013)
- Public Open Space in New Residential Development SPD (2007)

Who is accountable for delivering this?

- Nick Grayson
- Nicola Farrin
- Simon Needle

Link to SDG's:

11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.a Support positive economic, social and environmental links between urban, per-urban and rural areas by strengthening national and regional development planning

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

Whole Life Value Assessment

What are the cost implications of compliance? Within the context of the landscaping strategy the specification of trees will lead to a slight increase in cost but within the scale of development this is minimal. There may be some additional maintenance costs associated with a more intensive / extensive green space. Broadly speaking however due to the current nature of the site this is considered a low cost issue to address.
What are the cost implications of moving beyond compliance? Increases in green infrastructure costs within the context of the landscaping strategy will be minimal. Integrating design solutions such as green roofs and walls will lead to higher capital cost due to the additional engineering these systems require. They do have potential lifecycle savings through reduced building heating / cooling requirement reducing utility spend. As such, increasing urban greening through building integrated measures, such as green walls and green roofs, will increase the capital cost but has the potential to reduce the heating and cooling demand of the building leading to lower operational cost. In addition, increasing green infrastructure has wider user value within the development.
What is the value of moving beyond compliance? Green infrastructure costs within the context of the landscaping strategy will lead to value in the perception of the development and user enjoyment. It is also a visible sign of the sustainability credentials of a development. Beyond the landscaping strategy integrating building level features has the potential to reduce operational costs of the buildings but needs to be understood in the context of removing uses from roofs to other building locations. There is also significant overlap in this issue and other issues within the sustainability strategy meaning investment in this issue may deliver additional cost benefits elsewhere. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for urban greening.

Whole Life Value		
Economic		
Social		
Environmental		

1.08 - How will the masterplan address long term sustainable management of the development?	
Delivery of a long term sustainable energy plan will help residents realise sustainable energy management across the lifecycle of the development. To support this ALL buildings and individual residential units should be supported by a sub-metering strategy.	
Compliant / Standard Practice ALL buildings within the development will have sub-meters installed.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase • http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper • Core Strategy Policy TP1
Best Practice ALL of the Smart Meters installed will support half hourly metering and will report usage to residents / buildings users of their energy performance against the development average. ALL Office buildings will have a sub-metering strategy which will include individual floors and will allow for tenant areas to be sub-metered.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase • *In Lyon, a metering campaign is being implemented. This will enable local authorities as well as residents to better understand buildings behaviour and come up with ways by which overall energy efficiency could be improved. For the purposes of the urban redevelopment project, metered data will be sent to the CMS and, together with data from other buildings within the area, will be made available for the purposes of analysis by local authorities for future energy policies.*
Aspirational The development integrates Smart Grid Technology, including sensors within the Public Realm to support the delivery of a Smart City. This should be linked to the Digital Birmingham Strategy and include the provision of urban sensors connected to a central reporting platform that delivers a Smart City solution. This includes the potential to incorporate solar benches: The solar powered benches should offer; free Wi-Fi, charging points for mobile devices, and sensors to capture air quality, temperature, CO_2 emissions, and noise.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase • http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper ○ Core Strategy Policy TP4 • Carbon Plan Analysis (2013) • Technical Paper 1 - Carbon Dioxide Emissions Reduction Target Baseline (2013)

Who is accountable for delivering this?

- Richard Rees / Jackie Homan
- Raj Mack

Link to SDG's:

5. Achieve gender equality and empower all women and girls

5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women

7. Ensure access to affordable, reliable, sustainable and modern energy for all

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

Whole Life Value Assessment

What are the cost implications of compliance? The additional capital cost for the installation of sub-metering is minimal. In support of any metering that is installed an effective strategy to the long term energy management of the project can support significant whole life savings. Sub-metering allows people to more readily identify with their energy and water consumption and therefore make changes to their behaviours. This in turn can deliver long term savings. In addition, incorporating this strategy into a wider 'smart' system will enable knowledge to be shared across Birmingham and enable people to live more sustainable lifestyles.

What are the cost implications of moving beyond compliance? As above the capital cost for installation of metering should be minimal and should be incorporated within the M&E design for the development. The strategy and monitoring of in use energy and water may incur slight additional cost but should be covered by development service fees or by the utilities provider.

What is the value of moving beyond compliance? There is more social than monetary value in moving from Compliance. The Digital Strategy for Birmingham highlights the role of Smartt Grids and the incorporation of infrastructure that can support more sustainable lifestyles.

Whole Life Value		
Economic		
Social		
Environmental		

1.2 Energy and Climate Action Cost Benefit Analysis

This section attempts to provide a high-level review of potential electricity and heat technology bricks that could be deployed as part of the Birmingham Smithfield redevelopment to support its ambition of being carbon neutral.

As the development is still at the master plan stage a range of assumptions have been made on the building sizes, designs and energy requirements. Therefore, the ability for each technology to be compatible and to provide a certain quantity of electricity and heat is indicative.

The cost benefit analysis does not look at how the various technologies can be combined to provide the overall scheme design. This section provides information about the different components that could be used in an energy system solution, but does not provide analysis of a design for the scheme. Information is provided on each component based on a sizing that is relative to the scheme. However, we have not sized them for an energy system design - the components cannot simply be added up to form an energy system

It is recommended that once more detail on the developments design and specification are known a more detailed assessment is undertaken to determine how the various technology bricks could be combined.

Applicable Technology	***Relevant Key Question***
Energy Distribution	*1.01; 1.02; 1.03; 1.04: 1.05; 1.06;*
Energy Conversion	*1.01; 1.02; 1.03; 1.04; 1.05; 1.06; 1.08*
Energy Storage	*1.01; 1.02; 1.03; 1.04; 1.05; 1.06;*
Energy in Buildings	*1.01; 1.02; 1.03; 1.04; 1.05; 1.06; 1.08*
Offsite Renewables	*1.01; 1.02; 1.03; 1.04; 1.05;*
New Technologies	*1.01; 1.02; 1.03; 1.04; 1.05;*

Energy Distribution

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
District heating scheme	Supply all heat requirements from low carbon sources 4th generation network allows mix of technologies to be combined Centralised heat sources are more efficient and lower unit cost No need for gas network to individual buildings Potential to add new heat sources/technologies as scheme grows	Investment in heat network, potential from private investors i.e. ESCos Network losses to consider	Supply most heat from low carbon sources	NA	£2.7-£3m distribution £1.2-£1.5m substations	N/A	Economic compared to total life cost of alternatives Concession model could allow private financing	High
District cooling scheme	As for heat Potential to recover some rejected heat Ability to reduce urban heat island effects	Investment in cool network	Supply cooling from low carbon sources to the leisure, cultural and mixed use buildings as well as hotels. Would not supply cooling to the residential areas or markets.	NA	£1-£1.2m distribution on top of the district heating network cost £0.8-1m substations	N/A	Economic compared to total life cost of alternatives Concession model could allow private financing	High
Connection to Birmingham DH Scheme	Connection to wider scheme increases network resilience	Smithfield network likely to operate at lower temperature. Costs associated with installing a 325m pipe route BDEC carbon content too high with current plant	BDEC to supply low carbon heat to development with a reduced need for additional plant	NA	£0.9-£1.2m	Circa 4,100,000kg	Would improve current operating regime at the Broad Street and Aston DH schemes and reduce the amount of additional low carbon plant required at Smithfield.	High
Onsite Energy Centre	Removes the need of having individual boilers and chillers for each building. Allows mix of low carbon technologies to be combined particularly if supplying district energy. These technologies can be of larger scale giving higher efficiencies. Ensures resilience of the supply of energy to the developments	Network losses that wouldn't be associated with individual plantrooms for each development will be present.	Supply all heat to the buildings in Smithfield and cooling to all the leisure, cultural and mixed use buildings as well as the hotels.	NA	£1-2m for fit out on basement of existing building (switchboards, pumps, ancillaries etc.)	N/a	Large centralised energy centre cheaper than individual boilers and chillers for each building. Large scale plant cheaper £/kW than small. Total plant capacity for the Smithfield development can be smaller if plant is centralised as it will take into account the diversification of the total peak load i.e. not every development	High

							will request maximum heat demand at the same time.	
Smart Electrical Grid	Potential to combine different generation sources locally Maximise use of demand side flexibility Single heat/cool/power control room manages interactions Optimise use of different sources of generation and flexibility Local resilience	Investment in smart grid Likely to be more expensive than standard DNO connections Current regulatory structure	Supply all electricity and local generation connections	NA	Additional metering, cabling etc. cannot be estimated until design completed. Likely to be service charged as a % OEM	~3,691,709 (10% of scheme)	Cost would be estimated accurately as part of the design process for ancillary metering and other control components. Service costs would be based on a % of the integrated scheme for the operation, maintenance and IT interfaces which may be required. Likely to be operated by an independent network operator attracting a service charge.	High
District heating scheme	Supply all heat requirements from low carbon sources 4th generation network allows mix of technologies to be combined Centralised heat sources are more efficient and lower unit cost No need for gas network to individual buildings Potential to add new heat sources/technologies as scheme grows	Investment in heat network, potential from private investors i.e. ESCos Network losses to consider	Supply most heat from low carbon sources	NA	£2.7-£3m distribution £1.2-£1.5m substations	N/A	Economic compared to total life cost of alternatives Concession model could allow private financing	High

Energy Conversion

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
Heat Pumps - heating and cooling provision **- Ground Source (GSHP)** **- Water Source (WSHP)**	Heat Pumps provide high efficiency for heat production Ground source installed at construction Deep source provides constant thermal source/sink Centralised units have high efficiency/lower unit cost HP can be used for both heating and cooling No local emissions WSHP are more efficient than GSHP and are less invasive, but potential dependent upon local water sources	Requires low DH temperatures Annual savings against notional gas boilers reduced if spark spread increases. Careful consideration required if run alongside CHP WSHP would require a large/flowing body of water	Capacity of GSHP is dependent on the area of ground that would be available to extract heat from. The large area of the site indicates that, hopefully, a GSHP for at least 3MW would be possible It is unlikely that a body of water suitable for WSHP is available.	£0.65m-£1.8m / MW depending on nature of ground loop type (horizontal or vertical) and installation Broadly similar cost for WSHP	£2m - £5.4m for 3MW	Circa 5,300,000kg	RHIs much higher than for biomass - a cheap way of producing heating and cooling. The high capital cost, particularly for vertical loop systems may be offset depending on the RHI tariffs which are subject to changes.	Med - requires support
Solar Thermal	Provide hot water for both residential and commercial / retail buildings. Note, hybrid solar thermal / PV units are being developed to allow better use of space. Potential to mount the hybrid units vertically on the side of buildings.	Use of roof space which may be needed for other services - or has recreational value. Could also compete for the space required for solar PV unless hybrid systems used.	See Rooftop PV below as most attractive deployment would be with the hybrid thermal / PV systems. Assuming kWh of thermal is 1.5x the kWh electrical generated. 3,750,000kWh of heat which could provide circa 10% of the developments hot water demand.	Additional £300 / kW on top of the PV costs below.	£1.3 Million Circa 5% - 10% reduction in costs would be a reasonable prediction between now and 2021. 2021 cost: Approx. £1.2 Million	Annual 810,000 kg CO2 saving	Two main funding models: 1. Self fund by developer. 2. Funded through third party who then recoups money through either an energy supply agreement or service charge. Note depending on the metering arrangements of the buildings the simplest model would most likely be an additional charge to a buildings service charge so as to avoid having to meter and bill multiple customers.	Med - requires support
Rooftop PV	Medium to high level of MW output in constrained urban setting Efficient source of green energy at comparatively low cost Easy to install and maintain Can provide a visible message on sustainable development	Use of roof space which may be needed for other services - or has recreational value.	Estimated capacities: Market = 200kW Cultural Buildings = 175kW Mixed Use = 1475kW Leisure = 125kW Residential = 500kW Hotel = 25kW Existing/Approved =	£900 / kW	£2.6 Million Circa 5% - 10% reduction in costs would be a reasonable prediction between now	Annual 1,297,500 kg CO2 saving	Two main funding models: 1. Self fund by developer. 2. Funded through third party who then recoups money through either an energy supply agreement or service charge. Note depending on the	High

			400kW TOTAL = 2,900kW or 2,500,000kWh Equates to 5-10% of energy demand. At this level, it is assumed all the electricity will be used when generated.		and 2021. 2021 cost: £2.3 - £2.5 Million		metering arrangements of the buildings the simplest model would most likely be an additional charge to a buildings service charge to avoid having to meter and bill multiple customers. Rooftop solar PV is viable now with little or no subsidy, providing onsite renewable energy generation and long term price stability.	
Organic PV	Technology has the potential to provide electricity at a lower cost than current PV technologies using less energy in production and more abundant materials. Potential to change colours, be semi-transparent and flexible making Organic PV attractive for Building Integrated PV applications.	Still in development to increase efficiency and lifetime. Unlikely to be commercially viable as a stand alone generation technology within the timeframe of this development.	Depends on timing of project and how advanced OPV is at the time. If buildings were clad it would have the potential to produce modest of the electricity requirements of the development. Assuming 25% coverage of one of the building facades: Circa 134kW or 117,000kWh or <1% of the developments electricity demand.	At this stage, Organic PV is roughly double the cost of current solar PV technology	Circa £270,000 Assume 25% decrease in costs between now and 2021.	Annual 60,723 kg CO2 saving	Due to type of installation best done at build stage by developer. Unlikely to be economic for the next decade.	Low
Biomass	Provide large source of low carbon heat	Large footprint Local emissions Transport of biomass into city centre Relatively expensive source of fuel, usually around 4p/kWh	Supply baseload heat requirements, circa 60% of overall annual demand. Approx. 60% CO2 reduction when used in conjunction with top-up gas boilers against a notional all-gas boiler equivalent	£220-£400 / kW	£660k - £1.2m for 3MW	circa 4,000,000kg	Eligible for RHI tariffs although lower than for GSHPs. However, the high costs of wood pellets make it no cheaper than using natural gas and the RHI tariffs are lower than the income/savings from offset electricity as associated with CHPs. Comparatively cheap capital cost compared to other renewable low-carbon plant and is less expensive and time intensive to maintain.	Med - requires support

							Can be used in conjunction with a thermal store to increase baseload operation.	
CHP	Relatively small footprint Economic benefits from the produced elec.	High maintenance and operation costs Requires regular downtime for servicing Local emissions Needs to be fired from grid injected green gas to be renewable.	Supply baseload heat requirements, circa 60% of overall annual demand Supply private wire or export elec to grid Approx. 40% CO2 reduction when used in conjunction with top-up gas boilers against a notional all-gas boiler equivalent Consumes a high amount of natural gas and the carbon benefits of offset elec will reduce over time. Unlikely to be seen as a low-carbon option in the long term.	£700-800/kWe	£2.2m - £2.6m for 2 x 1.6MW	circa 2,500,000kg	Expensive yet mature low-carbon energy provision plant CHPs likely to pay for themselves over a period of time depending on how well they are O&Med and finding a suitable party to supply private wire to. However fairly expensive to maintain, more so than for bio boilers and GSHPs and require frequent downtime periods. Could be used in conjunction with thermal stores to increase baseload operation particularly if the CHPs export to the grid to ensure operation during daily peak periods.	Low
Central Gas Boilers	Relatively small footprint Provide peak response at low cost	Needs to be fired from grid injected green gas to be renewable	Security of on-demand heat provision to development	£92-118/kW	£2.8m - £3.5m for 30MW boilers	N/a	Necessary to ensure heat provision to development, though preferred to be used as little as possible.	High
EFW Connection of existing EFW plant to DH scheme	There is an EFW plant in Tyseley that can be used Possible to buy heat very cheaply as is the case with the CSWDC EfW plant 3rd party could pay for some of the network costs Low footprint for plant required. No onsite plant asides from top up/back up gas boilers	Requires the installation of approx. 6km pipe Requires connection and offtake agreements with an additional party, Veiola who own the EfW facility Thermal Substation required to reduce temperature of offtake heat	Secured supply of very low carbon heat without the high O&M costs associated with CHPs and biomass boilers	NA	circa £6-£7 million for network + substation	circa 5,900,000kg	Depends on how quickly the benefits of the cheap abundant heat would offset our required investment of the network + thermal substation as well as annual amount of heat offtake available	Med
Waste Methanisation	(Production of electricity and heat from food waste in containerized units). Suited to small and medium scale sites that produce between 500kg and 3000kg of organic waste per day. Production of two renewables energies: heat and electricity that both benefit	This technology is now only operational with food waste. It can't treat raw urban waste. It would require a specific collection and further adjustments.	For the new commercial and retail space: Assuming that a market / business / collective restaurant produce 180 tons*/y of food waste, it would generate 66	140k£ for a 10kW unit (capacity of 182 tons waste) or	£440k For 1x10kW commercial and 1x40kW domestic unit.	Annual 594,00kg	The green electricity produced could benefit from the UK FIT scheme and generate 7,39p/kWh. What's more, if all electricity is not used on site, it could be exported to the grid and generate an additional	Med - requires support

	from a financial support in UK. Production of a fertilizer that could be used in the numerous parks of the new city centre project. Easy and quick installation. Modular and scalable technology Potential to treat all Smithfield's organic waste on site		MWh/y electricity and 123 MWh heat and 149 tons fertiliser. For the new homes: Assuming the total 2000 household generate 422 tons** bio-waste per year, this allows to produce 140 MWh/y electricity and 275 MWh/y heat, and 310 tons fertiliser. Circa 2% of hot water demand & <1% electricity	300k£ for a 40kW unit (capacity of 912 tons waste). Possibility to buy several unit of 10kW.			4,85 p/kWh. The bio-heat produced can also benefit from a financial support (RHI program) at a tariff level of 4,43p/kWth (not applicable for the bio-heat used to heat the digester)	
VC Chillers	Reliable method of meeting the cooling demands High COP usually between 3 and 4 on average all year round.		Security of on-demand cooling provision to the leisure, cultural, mixed use and hotel buildings.	£125-£150/kW	£2.5m - £3m for 20MW	N/a	Likely to be necessary to ensure peak cool provision to development	Med
Absorption chillers	Supplies cooling using heat rather than elec, lower carbon emissions as a result. Can increase CHP and biomass boiler operation by introducing a heat for cooling demand particularly in summer.	Not always economical to run, particularly if supplied heat from bio boilers.	Supply some of the cooling baseload requirements to the leisure, cultural, mixed use and hotel buildings depending on operating regimes of the heating plant.	£150-£175/kW	£300k - £350k for 2MW capacity	circa 15,000kg	Can increase operation hours of CHPs, particularly in summer. Good operational cost benefits as electricity is displaced, particularly useful during peak periods when cooling demand is at its highest. High carbon benefits if supplied heat from biomass boilers when compared to elec-driven chillers. Scope to increase size of CHPs and maximise revenues if absorption chillers are added.	Med

Energy Storage

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
Heat Storage	Allows the capture and release of excess low-carbon heat. This increases running hours and overall production of low carbon heat from plant that require a threshold baseload, such as biomass boilers and CHP.	Storage space required. Requires high delta between flow and return for effective capacity storage	Reduces the need for heat from back-up/top up boilers during high demand if sufficient amount of stored heat is available.	£1000/m3 water	circa £200k for 2 x 100m³ tanks	Depending on amount of heat from natural gas boilers displaced	Should offer a decent payback, especially if in conjunction with CHPs which export to grid to allow for increased peak benefit or biomass boilers. Added benefit of offsetting gas from top-up/backup boilers, reducing CO2 emissions and carbon charges. Requires a large delta to be effective and modelled to ensure an optimum size is found.	High
Cool Storage - Latent Cooling	Allows the capture and release of energy used for cooling, increasing operation hours and low-carbon heat production from plant requiring a threshold baseload.	Low storage of energy per cubic metre due to low delta T between flow and return temperatures.	Can optimise usage from Abo chillers and VC chillers though this is limited unless a large size tank is used.	£1000/m3 tank	circa £100k for 100m³ tank	Depending on amount of heat from natural gas boilers and electricity for VC chillers displaced.	A large-scale cooling network, Smithfield could allow storage to be economic: CHP running hours could be increased and the import/export of elec could be optimised if the tank is charged at night then discharged during peak periods during the day. Unlikely to be as profitable as heat storage due to the less capacity per m3 that can be stored.	High
Cool Storage - PCM	Phase change materials reduce space due to larger energy storage capacity and increase efficiency	More expensive than water-based tanks. Limited charge/discharge rates.	Can store a lot more energy for cooling, increasing the operating regimes of plant that require a baseload.	£2500/m3 tank incl, PCM-filled containers	circa £250k for 100m³ tank	Depending on amount of heat from natural gas boilers and electricity for VC chillers displaced. A lot more than water-based storage tanks if similar sizes.	More expensive than water-filled storage tanks but can store a lot more energyper m3 allowing for further CHP and elec import/export optimisation	Low

Electrical storage	Future potential to capture excess renewable generation at site for later usage making maximum use of the renewable electricity generated. Potential to obtain additional revenue streams from the storage through grid services contracts. Currently WPD have some issues around Birmingham area, storage could be used to help the DNO deferring network upgrades (investment deferral), especially if the development will lead to load increase. Critical component if you want to build a micro grid but economics hard at the moment.	Currently batteries only work commercially with grid services contracts. It could be a decade before large batteries are commercially capable of long term energy storage. Depending on which energy storage technology is chosen for the site, duration of service and degradation of asset will be an issue. If Li-ion batteries used fire risk exists. Small issue with cooling fans if close to residential amenity costs.	Make all renewable generation dispatchable, important if goal is to be 100% renewable. Potential to assist the local network cope with the new development, could minimise or offset the need for upgrades.	Economies of scale exist, duration of the service is key, prices vary significantly depending on what it is being used for, £2 M/MW based on a 30min battery.	Assuming a 5MW demand for the development and a battery which is able to store 20% of this for a short duration to overcome small peaks a 1MW battery could be used = Circa £2M Potentially 10% - 15% drop depending on market circumstances and the continued increase in uptake of the systems across the grid and in commercial environs.	No CO2 saving in its own right, used to manage energy usage.	1. Use in conjunction with onsite renewables, however this is commercially very difficult currently. 2. As a way to offset network upgrade costs. 3. Allow buildings to provide grid services working alongside demand side management.	Med

Energy in Buildings

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
Building Design	Design can significantly reduce consumption and peaks Heating/cooling within building mass Design for low temperature district heating and cooling Separate Heat/HW circuits	Specify requirements to developers/designers District energy input into design at early stage Potential tensions with space and development cost	Significant potential input on system peaks and efficiency.		Low/Med	3,691,709 (10% of scheme)	Planning requirements on developers - developers incur any additional construction costs	High
Smart Commercial	Optimise building as part of energy system Reduction in peak energy Improve efficiency, carbon intensity & system resilience	Additional metering, control and communication equipment Clear technical specification to enable system optimisation Needs to be specified as part of build	~10% reduction in energy use ~20% reduction in system peak use for heat and cool, ~10% reduction in system peak power Increase level of energy met by renewables	£30-50k / building	£0.5-1m	3,691,709 (10% of scheme)	Planning requirements on developers - developers incur additional installation costs Should be economic on a new build Potential revenues from providing services to national grid	High
Smart Domestic	Optimise residences as part of energy system Increase residents' visibility/control/engagement with energy Reduction in peak energy Improve efficiency, carbon intensity & system resilience Improve involvement of the inhabitants through visibility and action on energy	Additional control and communication equipment Clear technical specification to enable system optimisation Needs to be specified as part of build Who ultimately owns the data and what can it be used for?	~10% reduction in energy use ~20% reduction in system peak use for heat, ~10% reduction in system peak power Increase level of energy met by renewables	£300-700/home	£0.5m-£1.5m	3,691,709 (10% of scheme)	Planning requirements on developers - developers incur additional installation costs Should be economic on a new build Potential revenues from providing services to national grid	High
Building Design	Design can significantly reduce consumption and peaks Heating/cooling within building mass Design for low temperature district heating and cooling Separate Heat/HW circuits	Specify requirements to developers/designers District energy input into design at early stage Potential tensions with space and development cost	Significant potential input on system peaks and efficiency.		Low/Med	3,691,709 (10% of scheme)	Planning requirements on developers - developers incur any additional construction costs	High

Offsite Renewables

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
Ground Mounted PV	Mature renewables technology that has been deployed at scale in the UK. Electricity could be supplied through the grid and balanced with demand from other sources through the electricity supplier. Price of panels is rapidly reducing. Would not have to be built close to the development, could in theory be built anywhere in the UK and electricity supplied though the grid.	All subsidies have been removed. Currently un-economic without support.	To achieve 50% of overall electricity, demand a 20.8MW ground mounted project would be required.	£0.8 Million/MW	£16.6 Million Potential for a circa 5% to 10% further cost reduction between 2016 and 2020.	9,456,595kgCO^2	Economics of grid connected renewables poor currently. Could be supported through a long term PPA within the next 5-8 years if wholesale prices rise as expected and PV prices drop as expected. Would require a 50% CAPEX subsidy to make it viable currently.	Med - requires support
Wind	Mature renewables technology that has been deployed at scale in the UK. Electricity could be supplied through the grid and balanced with demand from other sources through the electricity supplier. Price of panels is rapidly reducing. Would not have to be built close to the development, could in theory be built anywhere in the UK and electricity supplied through the grid.	All subsidies have been removed. Currently un-economic without support.	To achieve 50% of overall electricity, demand a 6.5MW wind farm would be required.	£1.1 Million/MW	£7.2 Million No further cost reduction envisaged unless taller turbines are used which come with increased planning risk.	10,343,151kgCO^2	Economics of grid connected renewables poor currently. Could be supported through a long term PPA within the next 5-8 years if wholesale prices rise as expected and wind prices drop as expected. Would require a 25-50% CAPEX subsidy to make it viable currently.	Med - requires support
Green Electricity Contract	Could be used to either supply all of the developments energy needs with 100% green electricity. Or could be used to top up the onsite generation to achieve an overall (up to 100%) target. Available now with no upfront cost.	Likely to pay a premium above 'standard' grid electricity. Exposed to the fluctuations of the power market.	Up to 100%	Likely to be a 10-15% premium on standard grid electricity. Price dependant on time of contract.	Likely to be a 10-15% premium on standard grid electricity. Price dependant on time of contract.		Short term 1-2 year contracts with a supplier. Or Potential to sign long term power purchase agreement direct with a generator for the duration of the renewable energy project, 15-20 years.	High

Grid Injected Green Gas	Could be used to either supply all of the developments gas needs with 100% green gas. Or could be used to top up the onsite generation to achieve an overall (up to 100%) target. Available now with no upfront cost.	Likely to pay a premium above 'standard' grid gas. Exposed to the fluctuations of the gas market.	Up to 100%	`+A36:I39	Likely to be a 10-15% premium on standard grid gas. Price dependant on time of contract.		Short term 1-2 year contracts with a supplier. Or Potential to sign long term power purchase agreement direct with a generator for the duration of the renewable energy project, 15-20 years.	High

New Technologies

Technology	Benefits	Issues	Scheme Potential	Cost / Unit	Scheme cost	Annual CO2 Saving	Commercial Models / Economics	Economic viability
Fuel cells	No local emissions Low maintenance costs Could potentially supply elec to VC chillers and GSHPs	Very expensive New technology Only used in niche applications such as environmentally sensitive areas.	Could be a major contributor to district energy schemes when the cost reduces and the technology is more reliable	£3m-£5m/MW	£9m - £15m for 3MW	Unknown	No economic viability to fuel cells at this time due to high cost and an immature technology. May be worth considering in the future.	Low

2. Water

Climate change is likely to impact on water supply and management due to increasing irregularity in precipitation patterns and a higher likelihood of droughts. Protecting and conserving water supplies and resources in order to secure Birmingham's needs in a sustainable manner is seen as an urgent priority. It is recognised that in order to achieve this, water consumption per person needs to be reduced.

Surface water flooding is the most likely flooding risk that a development in Birmingham may be exposed to. This risk is likely to increase due to the expected increase in intensity of rainfall events and continuing urbanisation within Birmingham leading to an increase in impermeable surfaces. The water table in Birmingham is also recognised to be rising due to reduced need from industrial processes leading to a potential increase in localised flooding.

2.01 - Will the development be designed to enable the efficient use of potable water in residential buildings?	
Currently the UK average water consumption is 150 litres per person per day. Only 4%of this is used for drinking with almost one third of potable water used for toilet flushing. Potable water consumption in residential buildings can be reduced through the specification of water saving measures and equipment.	

Compliant / Standard Practice
The development is designed to enable potable water usage of ≤ 125 litres / person / day for residential buildings through incorporation of water saving measures and equipment.
	Relevant Policy / Guidance
	• Part G of the Building Regulations now contains 'optional' levels of performance. Section G2, paragraph 2, sets two levels of performance for water consumption. These are either:
	  ○ 125 litres/person/day (the 'baseline' standard);
	  ○ 110 litres/person/day (an 'enhanced' standard).
	• Requiring new developments to reduce CO_2 emissions and water consumption (Policy TP3)

Best Practice
The development is designed to enable potable water usage of 110 litres / person / day for residential buildings through incorporation of water saving measures and equipment.
	Relevant Policy / Guidance
	• Part G of the Building Regulations now contains 'optional' levels of performance. Section G2, paragraph 2, sets two levels of performance for water consumption. These are either:
	  ○ 125 litres/person/day (the 'baseline' standard);
	  ○ 110 litres/person/day (an 'enhanced' standard).
	• Requiring new developments to reduce CO_2 emissions and water consumption (Policy TP3)

Aspirational
The development delivers a 50% improvement on Building Regulations Document G enhanced standard (55 litres/person/day).
	Relevant Policy / Guidance
	• Part G of the Building Regulations now contains 'optional' levels of performance. Section G2, paragraph 2, sets two levels of performance for water consumption. These are either:
	  ○ 125 litres/person/day (the 'baseline' standard);
	  ○ 110 litres/person/day (an 'enhanced' standard).

	• Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Who is accountable for delivering this?

- Clive Wright
- Kerry Whitehouse
- Severn Trent Water

Link to SDG's:

6 Ensure availability and sustainable management of water and sanitation for all

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.b Support and strengthen the participation of local communities in improving water and sanitation management

Whole Life Value Assessment

What are the cost implications of compliance? Specifying low flow and low volume fixtures and fittings will represent a potential slight capital cost increase against 'standard' fixtures and fittings (as set out in Part G of the Building Regulations). The feasibility of meeting the requirement without replacing potable water consumption with other sources (such as greywater and rainwater) needs to be considered to provide clear cost guidance. At a high level, the fixtures and fittings will represent a slight cost uplift but additional systems infrastructure will require additional investment. This needs to be balanced carefully against utility cost to ensure whole life value is delivered.

What are the cost implications of moving beyond compliance? As above, the technical specification of meeting reduced potable water consumption is a design issue. Where this cannot be met then potable water consumption needs to be replaced with other sources. This can include grey and rainwater systems that attract additional capital cost over standard potable water infrastructure as it is collected and distributed in separate pipework.

What is the value of moving beyond compliance? It should be noted that some post-occupancy evaluations have noted user dissatisfaction with the flow rate of some services (most notably showers) and this represents a potential cost where systems are changed at the request of users. This is potentially a deterrent which may reduce sale price affecting profitability on individual units.

Consideration needs to be paid to the cost of water provided by a utility and the capacity within existing systems to service the site. Additional maintenance cost may also be incurred. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for efficient use of potable water in residential buildings will be predominantly economic and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

2.02 - Will the development be designed to enable the efficient use of potable water in non-residential buildings?

Water efficiency in non-residential buildings is a BCC Priority with policy stating that new non-residential developments should aim to achieve the maximum number of water credits in a BREEAM assessment.

Compliant / Standard Practice

Non-residential buildings within the development will achieve the number of Water credits required for BREEAM Excellent:

- From 107 to < 118 litres / person / day.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Best Practice

Non-residential buildings within the development will achieve the number of Water credits required for BREEAM Outstanding:

- < 96 litres / person / day.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Aspirational

Non-residential buildings within the development will deliver a 50% improvement:

- < 48 litres / person / day.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Who is accountable for delivering this?

- Clive Wright
- Kerry Whitehouse
- Acivico

Link to SDG's:

6 Ensure availability and sustainable management of water and sanitation for all

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.b Support and strengthen the participation of local communities in improving water and sanitation management

Whole Life Value Assessment

What are the cost implications of compliance? Specifying low flow and low volume fixtures and fittings will represent a small capital cost increase against 'standard' flow rate fixtures and fittings. This is however highly dependent on the contractor supply chain and its ability to delivery to design specification.

What are the cost implications of moving beyond compliance? It should be noted that there is no requirement to limit building user access to water, but that the rate at which this is provided is limited through low flow / flush services. This will require a technical solution in terms of water infrastructure and a programme to encourage behaviours of building users.

What is the value of moving beyond compliance? Minimising design water consumption and actual performance need to be measured carefully to ensure specification meets expectation. This is an important consideration in terms of whole life value as it allows the building users to identify the running cost of their assets. Consideration needs to be paid to the utility cost of water provided by a utility provider and the capacity within existing systems to service the site.

Whole Life Value		
Economic		
Social		
Environmental		

2.03 - Has the development been designed to incorporate rainwater / greywater harvesting?

Using alternative sources of water, such as rainwater and greywater, for uses other than drinking can contribute to reduced potable water consumption and help to ensure that potable water is not wasted.

Compliant / Standard Practice

A cost-benefit analysis that considers whole life costs and the carbon footprint implications of different rainwater harvesting and greywater recycling systems will be conducted to identify and implement the most appropriate solution.

This includes understanding the costs / benefits and feasibility of a rainwater harvesting system incorporating blue roofs for water storage and a district scale non-potable water system supplied by rainwater from buildings and hard landscape.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

Where 26% to 50% of the total hard surface for the site (roof plus hard-standing) is designed to allow the harvesting of rainwater for re-use.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Aspirational

More than 50% of the total hard surface for the site (roof plus hard-standing) is designed to allow the harvesting of rainwater for re-use.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Who is accountable for delivering this?

- Clive Wright

Is this a process or an Output?

- Process to identify potential savings.

Link to SDG's:

6 Ensure availability and sustainable management of water and sanitation for all

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.b Support and strengthen the participation of local communities in improving water and sanitation management

Whole Life Value Assessment

What are the cost implications of compliance? Rainwater harvesting systems incur additional capital cost whilst having the potential to reduce operational cost. Typically speaking the cost will incorporate:

- Installation costs;
- Replacement cost after of main system components (where applicable): Pump (every 10 years); UV disinfectant unit (two years); Treatment Membrane (two years)
- Day-to-day maintenance costs such as: Clearing blockages; Servicing pumps, etc.
- Energy costs (for example pumps for the distribution system).

These costs must be reconciled with the potential water savings that each
system could deliver for comparative purposes. As rainwater is harvested it requires storage. It also requires additional distribution infrastructure, notably pipework, to reduce risk of disease. Typically speaking rainwater is used to flush toilets. These do not represent a considerable additional cost in isolation, but the additional pipework they require does. This also has ramifications in terms of access for maintenance. Depending on collection the water may require pumping and so additional cost for this is a consideration as to whether the specification of such a system represents whole life value. Where rainwater is used in irrigation the options for collection and distribution need to be considered and assessed as this can have significant implications on costs.

What are the cost implications of moving beyond compliance?

Incorporating greywater requires additional plumbing infrastructure to capture and store greywater. Again, this is typically used to flush toilets and as such will incur additional capital cost. In addition, there are requirements to flush systems regularly to reduce the risk of disease.

What is the value of moving beyond compliance? Detailed whole life cost assessments should be undertaken to provide detailed comment on the whole life value of greywater systems. Typically speaking they do incur additional capital cost as they require additional infrastructure (storage, pipework) to potable water distribution within buildings. However, where these systems replace potable water they have the potential to offer a direct saving on utility (water consumption) and as such their specification needs to be considered against a detailed whole life cost assessment. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for rainwater/greywater harvesting will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

2.04 - What measures have been taken to support the cleaning of Birmingham's waterways?

Birmingham's waterways provide a connectivity to the city's industrial past. They also provide a wide range of recreational spaces for city residents and support a wide range of ecosystem services. Maintaining water quality and promoting these spaces for recreation will support development users and promote connectivity to Smithfield.

Compliant / Standard Practice

The development includes a range of design measures that reduce the risk of surface water contamination entering public waterways. This includes the provision of SUDs / rain gardens integrated within the public realm.

In addition, a comprehensive and up-to-date drainage plan of the site will be made available to the authority responsible for maintaining the drainage infrastructure and future development users. This aims to prevent the proposed drainage being affected by future works or a lack of maintenance.

Measures are put in place to avoid any potential water pollution during construction in accordance with Environment Agency pollution prevention guidelines.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Best Practice

The development manages the discharge of grey and blackwater to reduce the risk of contamination of public waterways.

Management of grey water to include sewage.

In addition, an appropriately qualified professional designs a system to ensure that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with the SuDS Manual to minimise the risk of pollution.

SuDs are also designed with the multifunctional benefits of green infrastructure in mind including biodiversity and amenity value.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Note: The SuDS Manual best practice recommendations should be followed where there is a risk to groundwater from infiltration (for example, contaminated land or developments with high risk of pollution incidents).	
Aspirational The appropriately qualified professional confirms that there will be no discharge from the developed site for rainfall depths up to 5mm.	**Relevant Policy / Guidance** • http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf
Who is accountable for delivering this? • Clive Wright • Nicola Farrin • Simon Needle	
Link to the SDG's: **6. Ensure availability and sustainable management of water and sanitation for all** **6.6** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	

Whole Life Value Assessment

What are the cost implications of compliance? The development will need to consider the impacts of flooding and meet Policy requirements in this respect. In addition, considering the potential impacts of any surface water contamination will need to be considered and mitigated. Integrating design solutions to address these should be part of the overall landscape strategy and should incur minimal additional cost where considered early in the design process.

What are the cost implications of moving beyond compliance? The design team should appoint a suitably qualified individual to undertake this work which may incur additional design fees. However, any additional capital cost should be minimal. Where there is a significant risk of flooding then different design solutions will be required that may incur additional cost, including the specification of tanks to reduce the rate of discharge. The site however is considered to be of low flood risk and therefore any additional cost should be minimal.

What is the value of moving beyond compliance? The value of moving beyond compliance is the potential to reduce environmental risk and potential damage to buildings / infrastructure from the impact of localised flooding. There is some social value in this in reducing disruption to residents / the wider community and providing more outdoor amenity space within the development.

Whole Life Value		
Economic		
Social		
Environmental		

2.05 - Does the development incorporate leak detection?

Water is a finite resource that is under increasing pressure in urban areas. Limiting leakages from water infrastructure can reduce pressure on potable water and reduce disruption in the public realm when working on buried infrastructure.

Compliant / Standard Practice

The masterplan incorporates the specification of a water meter on the mains water supply to each building; this includes instances where water is supplied via a borehole or other private source.

There is also a commitment that water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with easily accessible sub-meters or have water monitoring equipment integral to the plant or area (see Compliance notes).

Each meter (main and sub) has a pulsed or other open protocol communication output to enable connection to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption.

Relevant Policy / Guidance

- BREEAM NC 2014

Best Practice

A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and across the development, and between the building and the utilities water meter is installed. The leak detection system must be:

- A permanent automated water leak detection system that alerts the building occupants to the leak OR an in-built automated diagnostic procedure for detecting leaks is installed.
- Activated when the flow of water passing through the water meter/data logger is at a flow rate above a pre-set maximum for a pre-set period of time.
- Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods.
- Programmable to suit the owner/occupiers' water consumption criteria.
- Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

Relevant Policy / Guidance

- BREEAM NC 2014

Aspirational

Relevant Policy / Guidance

- BREEAM NC 2014

A commitment is made that, at the building level, flow control devices that regulate the supply of water to each WC area/facility according to demand are installed (and therefore minimise water leaks and wastage from sanitary fittings).	

Who is accountable for delivering this?

- Clive Wright
- Birmingham Property Services
- Acivico / Severn Trent

Link to SDG's:

6. Ensure availability and sustainable management of water and sanitation for all

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Whole Life Value Assessment

What are the cost implications of compliance? Metering water mains allows utilities providers to understand better water consumption. It also allows third parties to identify the source of leaks more readily, reducing disruption to residents where works are required.
What are the cost implications of moving beyond compliance? There should be no additional cost to the project. Utilities providers should be encouraged to install equipment from the outset to support the long-term sustainability objectives of the project.
What is the value of moving beyond compliance? Reduced disruption to residents from any works that are required to remedy leaks. Water should also be considered a finite resource and therefore effort should be taken to reduce wasteful practises.

Whole Life Value		
Economic		
Social		
Environmental		

2.06 - To what extent has the development been designed to attenuate surface water runoff?

To encourage the effective management of storm water runoff and reduce the risk of surface water flooding, the development should aim to achieve greenfield run-off rates. In order to achieve this, it sets out a drainage hierarchy to encourage surface water run-off to be managed as close to its source as possible.

Compliant / Standard Practice

The development is designed to achieve 50% attenuation of the undeveloped sites surface water run-off at peak times.

This is achieved through following the Drainage Hierarchy:

1. Store rainwater for later use;
2. Use infiltration techniques, such as porous surfaces in non-clay areas;
3. Attenuate rainwater in ponds or open water features for gradual release;
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release;
5. Discharge rainwater direct to a watercourse;
6. Discharge rainwater to a surface water sewer/drain;
7. Discharge rainwater to the combined sewer.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

The development demonstrates that all practical and reasonable measures have been taken to achieve greenfield run-off rates. It is designed to achieve >51% attenuation of the undeveloped site's surface water run-off (at peak times).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

Ensure that the post development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been before the development. The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Clive Wright

Link to SDG's:

6 Ensure availability and sustainable management of water and sanitation for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Whole Life Value Assessment

What are the cost implications of compliance? To meet Compliance the development will be required to attenuate water on site. This will require storm water to be retained within the development. This requires a landscaping strategy that utilises open water storage on the surface of the development or 'tanking' of water, the siting of which is dependent on site layout. Specifying tanks will incur additional cost in both the equipment purchased and additional groundworks if they are sub-surface or structure within buildings if they are located in roof space. If the tanking is allocated in basement space this also represents a loss of gross internal space. The cost implication of this cannot be commented on as the location is as yet undefined but it is considered underground tanks represent the lowest cost option. The site may also consider permeable surfaces to increase the rate of infiltration. Their specification may incur additional capital cost based on the specification of higher grade block work.
What are the cost implications of moving beyond compliance? Water attenuation will require the specification of systems to reduce surface water runoff. As above this will require storing water but also increasing infiltration. The site is currently largely covered in hard surfacing and so the specification of permeable surfaces will be required. There may be some additional capital cost in the specification of specific blocks. As the site design may already require their specification the cost to increase this is negligible in light of the fact they might already be being used.
What is the value of moving beyond compliance? Reducing the rate at which water is discharged from site reduces the risk of localised flooding by overloading existing drainage infrastructure. The 'value' of this can only be demonstrated through the fact that this reduces the risk of damage to property and disruption to site users. This may reduce insurance costs, reduce the cost of repairing building damage and reduce the risk of lost revenue from disruption to businesses located on the site. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to attenuate surface water runoff will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

2.2 Water Cost Benefit Analysis

Estimates that an average person uses 100 litres / person / day (Water usage figures from "Waterwise" http://www.ccwater.org.uk/savewaterandmoney/averagewateruse/) at the high end of the scale. However, figures obtained from actual users meter readings suggest that this number is low and that the actual average usage is more in line with 150 Litres / person / day. Assuming the current baseline of 150 litres is used the water charging consists of a standing charge for the size of water supply meter which in this case would be relatively insignificant at an annual fee of £57.19 for a 30mm metered supply. The cost per litre of water consumed is then made up from a metered volume charge and an estimated effluent charge. Assuming that 150 litres is used and disposed of the estimated costs would be as follows:

150 Litres / person / day = £ 35.56
125 Litres / person / day = £ 29.64
110 litres / person / day = £ 26.08

The use of water saving measures would therefore have a direct cost benefit.

If a rainwater harvesting scheme was considered purely on the basis of water cost reduction / carbon reduction the Environment Agency (Energy and carbon implications of rainwater harvesting and greywater recycling, Report: SC090018) have reported that compared to using mains supplied water the economics and carbon footprint of a harvesting scheme are worse. This type of scheme would therefore need to be costed correctly but if it's purely on offsetting supply water the economics would not necessarily be beneficial.

In relation to surface water flooding several schemes and technologies have been assessed which indicates that If the retention of water (surface water) is required from a flood management perspective holding tanks and pumps are more easily affordable with low running costs.

3. Waste

Moving towards a more sustainable model of resource use and waste management is fundamental to achieving sustainable development. The management of waste can deliver positive environmental and economic outcomes during both the construction and operation of a development. There are a number of targets relating to waste including exceeding recycling and reuse levels in construction, excavation and demolition (CE&D) waste of 95% by 2020 and exceeding recycling / composting levels in municipal solid waste (MSW) of 45% by 2015, 50% by 2020 and aspiring to achieve 60% by 2031.

wbcsd

3.01 - Is there a commitment to minimise the generation of construction, excavation and demolition (CE&D) waste and maximise opportunities for it to be reused and recycled?

Adopting resource efficiency principles promotes the sustainable use of materials. This includes identifying opportunities for the re-use and recycling of existing materials. A Site Waste Management Plan (SWMP) requires developers to identify opportunities in their project delivery to reduce waste arising. WRAP's 'Designing out Waste' principles promote resource efficient design principles.

Compliant / Standard Practice

A pre-demolition audit is carried out using an appropriate methodology and a Site Waste Management Plan (SWMP) is implemented to recognise opportunities to design out waste at all stages of the development and increase opportunities for waste and recycling.

Reference has been made to WRAP's principles of 'Designing out Waste' either in Design Briefs or within the design intent of individual buildings to support resource efficiency.

Relevant Policy / Guidance

- WRAP Guidance on Designing Out Waste

Best Practice

Compliant / Standard Practice PLUS:

A strategy to design out construction waste will ensure that at least 90% of CE&D waste is re-used, recycled or recovered thereby minimising waste sent to landfill.

Relevant Policy / Guidance

- WRAP Guidance on Designing Out Waste

Aspirational

Best Practice PLUS:

A strategy to design out construction waste will ensure that 100% of CE&D waste is re-used, recycled, diverted from landfill or recovered thereby minimising waste sent to landfill.

Relevant Policy / Guidance

- WRAP Guidance on Designing Out Waste

Who is accountable for delivering this?

- Alan Bowley
- Birmingham Property Services

Link to SDG's:

12 Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Whole Life Value Assessment

What are the cost implications of compliance? Reducing the volume of material removed from site has a variety of cost implications. Firstly, identifying the potential volume of materials to be removed allows cost certainty in the detailed cost plan. Reducing the volume of waste and uncertainty over potential volumes reduces cost. The cut and fill analysis will support this. As there is an assumed level of cut and fill the extent to which this represents an additional capital cost and the level of potential saving is difficult to quantify. In addition, providing clarity in the cost associated with land remediation is difficult to quantify as the extent of remediation required is unknown. There is a direct cost associated with removal and disposal of contaminated materials and identifying opportunities to remediate and retain on site should be explored. Again, whether this is a more expensive remediation option is difficult to identify.
What are the cost implications of moving beyond compliance? The cost of reducing the volume of material removed from site has a number of benefits. Firstly, it reduces the volume of material removed from site and thus reduces the cost associated with removal and transportation from site. In addition, this reduces the cost of disposal. Additional cost can be incurred where the material removed is contaminated and may require specialised carrier licenses further increasing cost. Where this can be remediated and retained on site the developer can reduce potential cost. Retaining materials on site also reduces the volume of aggregate / materials required in the new development and therefore can reduce capital cost. Some additional engineering examinations may be required to ensure the materials / aggregate meet the required specifications and they will require storage on site.
What is the value of moving beyond compliance? Beyond the direct cost of removal and disposal, reducing vehicle movements arising from the site can improve: site safety by reducing the number of vehicle movements within the site boundary; public perception of the development by reducing the impact of lorries on surrounding roads and reduce noise arising from the site. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for waste arising from site enabling works will be a mixture of economic, social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

3.02 - How will the design of the development support efficient systems for operational waste management?

Considering the opportunity for incorporating efficient systems for operational waste management at an early stage in the design process presents the greatest opportunity to enhance waste management during operation and achieve more sustainable outcomes. Waste systems should be considered from a technical, spatial and user convenience perspective.

Compliant / Standard Practice All buildings within the masterplan meet requirements for the size and location of recycling, composting and refuse storage and its removal. The development is designed to maximise the opportunity to achieve a recycling target of 50%. Consideration is given to kerbside waste collection and the suitable allocation of waste facilities both internally and externally.	**Relevant Policy / Guidance** • Birmingham Development Plan • Birmingham City Council Waste Strategy
Best Practice Compliant / Standard Practice PLUS: The development is designed to maximise the opportunity to achieve a recycling target of 60%. The opportunity to incorporate best practice waste management infrastructure and systems (e.g. automated vacuum waste collection systems) is fully considered at an early stage in the design process and a cost-benefit analysis produced. Systems should support efficient waste management and also benefit the user experience through considering impacts such as waste collection vehicles and visual amenity.	**Relevant Policy / Guidance** • Birmingham Development Plan • Birmingham City Council Waste Strategy
Aspirational The development is designed to maximise the opportunity to achieve a recycling target of 100%. The opportunity to incorporate best practice waste management infrastructure and systems (e.g. automated vacuum waste collection systems) is fully considered at an early stage in the design process and a cost-benefit analysis produced.	**Relevant Policy / Guidance** • Birmingham Development Plan • Birmingham City Council Waste Strategy

Systems should support efficient waste management and the capacity to recycle and also benefit the user experience through considering impacts such as waste collection vehicles and visual amenity.	

Who is accountable for delivering this?

- Uyen Phan-Han
- Alan Bowley

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Whole Life Value Assessment

What are the cost implications of compliance? Ensuring appropriate waste infrastructure is designed in to the development may require some additional space / infrastructure which will attract an additional capital cost. Identifying opportunities to meet the requirement to recycle 50% of waste arising from site may require funding beyond capital investment to educate building users. Space will need to be provided to store the waste streams appropriately. Understanding this storage and its collection will have design implications and will thus potentially increase capital cost where specific design measures are required. The cost of recycling and storage is also entirely dependent on the waste streams. This could include general waste, composting etc. Meeting the 50% level will also require user awareness of the requirement. This will encompass issues such as paper use in offices, cups used etc. It will also be dependent on the business uses on site, for example a coffee / sandwich shop will potentially generate more waste than a small retail unit.
What are the cost implications of moving beyond compliance? Broadly speaking increasing the recycling target from 50% to 60% will require additional storage space, the potential to introduce additional waste streams and further education / training / awareness raising of building users. Specific technical solutions such as automated vacuum waste collection systems will represent a significant additional capital cost over just providing waste storage. The extent to which this waste is collected on site and the routes taken by refuge collection vehicles will have a direct capital cost. The extent to which this represents a cost is difficult to quantify without identifying the routes and the surface infrastructure required to support this. If this is within existing road layout / design then this does not represent an additional cost.
What is the value of moving beyond compliance? Reducing the volume of waste removed from site will reduce the cost of removal / disposal. It will also contribute to the image of the development and user perception Birmingham Smithfield's environmental credentials. Automated systems have the potential to offer a technological solution to waste management and demonstrate thought leadership in this area. Addressing waste management early in the design stage and designing in the required space will be more cost effective. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for efficient systems for operational waste management will be predominantly environmental and economic.

Whole Life Value		
Economic		
Social		
Environmental		

3.03 - Have structures and mechanisms been put in place to reduce waste generation, maximising re-use and recycling?

Reducing waste generation, and providing infrastructure to optimise waste segregation and recycling, can support a more resource efficient community.

Compliant / Standard Practice

BCC has developed a Smithfield specific 'Green Charter' which all residents and business sign up to. Emphasis is placed on a Resource efficiency commitment from residents and businesses.

Relevant Policy / Guidance

- http://nwbicester.co.uk/the-first-phase/living/residents-charter/

Best Practice

A waste management strategy / plan has been completed to confirm the estimated amount and types of waste arising from the site, with strategies in place to reduce these volumes within the first 5 years of occupation.

Relevant Policy / Guidance

- Birmingham Development Plan
- Birmingham City Council Waste Strategy

Aspirational

The Smithfield Development serves as a catalyst for the delivery of the Circular Economy in Birmingham. This will include the Sharing Economy.

Relevant Policy / Guidance

- XXXX

Who is accountable for delivering this?

- Alan Bowley

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

Whole Life Value Assessment

What are the cost implications of compliance? The development of a green charter will incur minimal additional cost to the project. The design team behind the masterplan should be able to produce this in consultation with Birmingham City Council. This should address how residents within the development can utilise the sustainability infrastructure provided to live more sustainable lifestyles. This includes the promotion of resource efficiency to reduce waste arising from the site. Moving to Aspirational Performance, the Circular Economy is an emerging theme within sustainability and has the potential to deliver significant lifecycle savings and efficiency. As part of a broader strategy for Birmingham, Smithfield has the potential to serve as a demonstrator project.

What are the cost implications of moving beyond compliance? Any additional cost is difficult to forecast without any existing residents or a wider strategy across Birmingham. However, supporting resource efficiency can deliver significant savings. WRAP identified the potential for UK businesses could save £6.4 billion per year by adopting more resource efficient practices.

What is the value of moving beyond compliance? The potential to support resource efficiency across Birmingham should be widely supported by the Council and serve as a catalyst for local businesses and residents to adapt their practices. As above there are significant financial savings that can be realised through the adoption of resource efficiency.

Whole Life Value		
Economic		
Social		
Environmental		

3.04 - Are measures in place to optimise on site waste re-use / reduction with the potential for energy from waste solutions?

Utilising waste arising from site as part of an energy from waste scheme will reduce vehicle movements required to remove waste and provide a lower carbon source of fuel.

Compliant / Standard Practice

A waste management strategy / plan has been completed to estimate the volume of waste arising from site that could be used within an energy from waste solution.

This is utilised as part of the energy strategy to identify options for lower carbon sources of energy / heat for the development.

Relevant Policy / Guidance

- Birmingham Development Plan
- Birmingham City Council Waste Strategy

Best Practice

Not Set.

Relevant Policy / Guidance

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Alan Bowley
- Richard Rees
- Sylvia Broadley

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Whole Life Value Assessment

What are the cost implications of compliance? A waste management plan should be developed during planning to support the Council in forecasting the long term waste generation from Smithfield. Extending this to other questions within this framework the waste management strategy should identify specific waste streams and how these could be reduced or diverted from landfill. This includes potential waste to energy generation or the support of the Circular Economy. This should incur minimal additional cost but serve to support the long term sustainability objectives of Smithfield.
What are the cost implications of moving beyond compliance? There are no KPI's identified beyond compliance. Any additional cost should be incurred by the service provider utilising the waste stream. It should be noted that this could serve as a revenue generator or provide additional social capital.
What is the value of moving beyond compliance? There are no KPI's identified beyond compliance.

Whole Life Value		
Economic		
Social		
Environmental		

4. Buildings

The buildings constructed at Smithfield present an opportunity to provide a showcase for low carbon and sustainable design. They should also promote resource efficiency, provide quality homes and work spaces that provide sufficient space.

4.01 - Have microclimatic factors influenced the location of building uses and orientation and design of buildings and public realm?

Microclimatic factors such as prevailing wind direction and solar exposure can influence the sustainability performance of a development. In order to maximise benefit, microclimatic factors should be considered during the design of a development. New development can also impact on microclimatic factors e.g. overshadowing and this should be considered during design.

Compliant / Standard Practice

A microclimate study has been conducted that identifies current microclimatic conditions and future conditions expected as a result of the proposed development. The findings of the study inform the design of the masterplan.

The following factors should be considered:

- Temperature/thermal comfort;
- Solar exposure including sky view and shadowing;
- Air direction, movement and speed;
- Dust and pollution;
- Acoustic environment.

Relevant Policy / Guidance

- *The design of buildings and public spaces in the urban redevelopment of Lyon Confluence has been done with the utmost consideration for energy efficiency and environmental quality. Studies have been conducted during the design phase of the development to analyse the following factors:*
  - *Block plan and bioclimatic design (Temperature, solar exposure, wind, etc.)*
  - *Hydrothermal comfort*
  - *Acoustic comfort*
  - *Visual comfort*
  - *Health and olfactory comfort*

- Birmingham City Council Environmental Protection Unit (EPU)

Best Practice

The location of building uses across the site and orientation and design of buildings and public realm respond to the findings of the microclimate study to take advantage of microclimatic conditions.

The masterplan demonstrates how positive outcomes will be delivered (e.g. reduced energy demand) as a result of responding to microclimatic conditions.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Aspirational

- An appropriate and diverse range of favourable microclimatic conditions have been provided throughout the development to cater for a wide range of personal preferences.
- The design of public space optimises microclimatic conditions at all times of the year.
- The location and design of pedestrian/cycling routes takes full account of microclimatic conditions.

The public realm incorporates fountains as an important sensory diversion in the urban scene of the City.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Who is accountable for delivering this?

- Josie Turner
- Simon Dellahunty-Forrest
- Dave Harris
- Mark Wolstencroft

Link to SDG's:

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Whole Life Value Assessment

What are the cost implications of compliance? There will be a direct cost associated with undertaking a microclimatic study but within the context of the masterplan this is very small and will increase professional fees associated with the design. The outcomes of this study have the potential to directly influence: building / materials specification could be altered where this is considered an issue, building design / orientation could be altered to maximise solar exposure and air flow. In addition, specific strategies for improving local air quality could be employed where dust and pollution are an issue and design features to overcome acoustic issues.

What are the cost implications of moving beyond compliance? There is the potential to significantly alter the design and layout of the site as a result of the microclimate study. This has the potential to alter a wide range of factors which will directly impact the performance of the project. This needs to be balanced carefully alongside other key criteria as part of the design development, as orientating buildings specifically to address microclimatic issues could impose a significant impact on the campus layout. However, where there are no issues and the existing design is not altered then there will be a slight uplift in cost in addressing any issues in responding to the study findings.

What is the value of moving beyond compliance? Delivering a comfortable environment in Birmingham Smithfield's spaces will support user perceptions of the site as a destination. Ensuring this environment is comfortable will ensure footfall and support local businesses, optimising the sustainability of these businesses and ensuring the image of the site is positive. Reducing heat gain has the potential to reduce the cooling requirement of buildings in summer leading to potential increased operational efficiency. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the location of building uses and orientation and design of buildings and public realm will be predominantly environmental and social.

Whole Life Value		
Economic		
Social		
Environmental		

4.02 - Will the non-residential buildings within the masterplan deliver high levels of sustainability?

BREEAM is the recognised sustainability rating for buildings in the UK. The UK Government has set a stretching target for new buildings to be zero carbon from 2019. There is currently no delivery framework for this, but the industry adopted BREEAM standard can support developers demonstrate their commitment to progressing towards this zero carbon standard.

Compliant / Standard Practice

All non-residential buildings (including education, commercial and student accommodation) are designed to meet BREEAM Excellent or equivalent.

Relevant Policy / Guidance

- Big City Plan
- http://www.birmingham.gov.uk/cs/Satellite/bigcityplan?packedargs=website%3D4&rendermode=live
- http://www.birmingham.gov.uk/cs/Satellite?c=Page&childpagename=Development-Planning%2FPageLayout&cid=1223346396882&pagename=BCC%2FCommon%2FWrapper%2FWrapper
    - Core Strategy Policy TP3

Best Practice

All non-residential buildings (including education, commercial and student accommodation) are designed to meet at least BREEAM Excellent with at least one building designed to meet BREEAM Outstanding.

Relevant Policy / Guidance

- *By complying with the HQE specifications, all the offices and homes in Lyon Confluence exhibited better energy performance than was required by applicable thermal regulations. Focus was given on enhancing energy efficiency already mandated by the thermal regulations, introducing the use of renewable energy, and offering innovative technologies that allow energy monitoring and management. The buildings use 30-90 kWh/m2 which is 3-10 times less than old buildings (200-400 kWh/m2/yr) nd 2-4 times less than the required thermal regulations (120 kWh/m2/yr).*
- *The buildings that are part of the urban redevelopment are designed to meet the requirements of the Thermal Regulations RT 2012, requiring that residential and non-residential buildings use a maximum of 40-65kWh/m2/pa depending on locality and altitude of the building. The thermal envelope components and most energy consuming systems including, HVAC, hot water, lighting, heat recovery and auxiliary systems have been designed to conform to the requirements accordingly.*

Aspirational	Relevant Policy / Guidance
Opportunities for alternative building certification standards are explored. This could include the delivery of ONE building built to The Living Building Challenge.	• http://living-future.org/lbc

Who is accountable for delivering this?

- Josie Turner
- Birmingham Property Services

Link to SDG's:

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Whole Life Value Assessment

What are the cost implications of compliance? Buildings designed to meet BREEAM 'Excellent' standards are demonstrated to have lower operational costs. The report "The Value of BREEAM" (BISRIA, 2012) shows that achieving BREEAM ratings can be done without significant increase in Capex. The capital cost uplift for achieving BREEAM 'Very Good' is typically less than 0.5% extra. Higher BREEAM ratings require an increase in capital expenditure – usually less than 2% uplift from 'Very Good' to 'Excellent'.
To minimise costs, sustainability must be considered early in the design process as costs increase dramatically by 'adding-on' sustainability initiatives at later stages. Whilst higher BREEAM ratings have higher Capex, the fact that they deliver Opex benefits should not be forgotten. The report "Delivering Sustainable Buildings" (BRE & Sweet Group, 2014) suggests payback for achieving BREEAM 'Excellent' can be as quick as 2-5 years.
What are the cost implications of moving beyond compliance? The report "The Value of BREEAM" (BISRIA, 2012) shows that the capital cost uplift for achieving BREEAM 'Outstanding' is typically between 5% and 10%. Evidence demonstrates that the cost associated with higher levels of BREEAM performance can be recovered over the buildings lifetime. Corporate occupiers are also increasingly aware of the role of built assets in their costs and public image and there is growing evidence that 'green' buildings attract a premium. As such not building to a high specification may mean that potential corporate occupiers do not locate at the site. Meanwhile it should be recognised that BREEAM requirements are regularly updated, but that evidence indicates that design and technology advances in order to meet these challenges without adding significant additional costs.
What is the value of moving beyond compliance? The issue of BREEAM accreditation and value for the development is subjective. There will be an additional cost associated with undertaking Certification but evidence demonstrates that this can be as low as 0.5%. There is a significant reputational risk associated with not pursuing environmental accreditation and achieving high levels of performance. There is also the potential for landlords to charge a higher rental premium. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to deliver high levels of sustainability for non-residential buildings will be a mixture of environmental, social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

4.03 - Will the residential buildings within the masterplan deliver high levels of sustainability?

Individual residential buildings will underpin the sustainability of Smithfield and support residents to live a low carbon lifestyle. In 2012 residential buildings contributed 13% of the UK's emissions directly, and a further 10% through indirect emissions.

Compliant / Standard Practice

A commitment is made that all new residential buildings will be assessed against a recognised domestic Certification Standard, including (but not limited to) Home Quality Mark, Passivhaus etc.

Where utilising Home Quality Mark, a minimum Rating of 2 Stars is required.

All residential buildings will be designed to ensure interior quality and meet national space standards.

Please Note: BCC BMHT work towards equivalent of Sustainable Code Level 4

Relevant Policy / Guidance

- http://www.homequalitymark.com/
- Supporting the delivery of the principles of sustainable neighbourhoods in residential development (Policy TP26):
- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Best Practice

Where utilising Home Quality Mark, a minimum Rating of 4 Stars is required.

Relevant Policy / Guidance

- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)
- BCC BMHT work towards equivalent of Sustainable Code Level 4.

Aspirational

Where utilising Home Quality Mark, a minimum Rating of 5 Stars is required.

Relevant Policy / Guidance

- Requiring new developments to reduce CO2 emissions and water consumption (Policy TP3)

Who is accountable for delivering this?

- Josie Turner / Paul McGrath

Link to SDG's:

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Whole Life Value Assessment

What are the cost implications of compliance? Research has demonstrated that the additional cost of building to CfSH Level 3 is around £1500 per unit. There is no clear evidence that purchasers will pay a premium for sustainably accredited homes. However, it has been demonstrated that there are potential substantial operational savings for the occupier and when these are communicated a premium can be achieved.
What are the cost implications of moving beyond compliance? Research has demonstrated that the additional cost of building to CfSH Level 4 is around £3000 per unit. As above whether this attracts a sales premium is not clear within the housing market.
What is the value of moving beyond compliance? Overall costs of building to the CfSH have reduced over the past few years. At CfSH Level 4 there is clear value to occupiers from reduced operational costs, anticipated to be between 7 – 11% lower than housing built to Building Regulations. Going beyond Level 4 is also becoming cost effective. Per dwelling costs of meeting CfSH 5 have fallen from a range of £16.5k–23k in a 2011 study to around £6.5k–10.5k today (a reduction of around 55%). There are additional benefits to home owners of CfSH rated homes. A CfSH Level 5 home has a predicted annual energy bill of £682, 38% lower than that of a home built to minimum building regulation standards (£1,098). It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to deliver high levels of sustainability.

Whole Life Value		
Economic		
Social		
Environmental		

4.04 - Does the development comprise of a range of housing types, including mixed tenure, to support a diverse community?

Housing provision should meet the needs of existing and future communities. Providing a range of housing types that support different sections of the community will provide a diverse community at Smithfield.

Compliant / Standard Practice

The development meets its required affordable housing targets through integrated housing that is mixed and balanced by tenure. Affordable housing includes social rented and intermediate housing.

The affordable housing target for Birmingham CC is 35%. Where this is not financially viable the Council will accept a financial contribution to provide affordable housing elsewhere in The City.

Relevant Policy / Guidance

- Birmingham Development Plan
- New Birmingham Housing Plan
- Supporting the delivery of the principles of sustainable neighbourhoods in residential development (Policy TP26).

Best Practice

Affordable housing is integrated throughout the development and is indeterminable from housing for public sale.

Relevant Policy / Guidance

- Birmingham Development Plan
- New Birmingham Housing Plan

Aspirational

The development incorporates 5% of dwellings built in compliance with Approved Document M: Access to and use of buildings and / or The Lifetime Homes Standard.

Relevant Policy / Guidance

- Birmingham Development Plan
- New Birmingham Housing Plan
- http://www.lifetimehomes.org.uk/

Who is accountable for delivering this?

- Josie Turner / Paul McGrath
- Clive Skidmore

Link to SDG's:

1. Make cities and human settlements inclusive, safe, resilient and sustainable

1.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums

Whole Life Value Assessment

What are the cost implications of compliance? In providing a range of affordable housing the development will incur a potential reduced return on investment, whereby the sales premium at a market rate is not achieved for affordable housing units, with the extent of this subject to the % of affordable housing required by Birmingham. Dependent on the sustainability certification required then there will be an additional cost, in line with costs for delivering Code for Sustainable Homes certification beyond that required for planning. Where the housing is built for a specific social housing provider there may be an additional cost in meeting their design specification.
What are the cost implications of moving beyond compliance? Integrating the affordable housing across the development does not necessarily represent a potential additional cost beyond meeting required standards, dependent on building design. This may represent an additional cost in maintenance where the housing is located across the site.
What is the value of moving beyond compliance? Integrating affordable housing across the development will support cohesion. This could support a vibrant community and create a sense of this within Birmingham Smithfield. The value of this is highly dependent on occupiers but the range of amenities being provided could support a vibrant community. Where affordable housing is integrated there may be negative perceptions to market housing being located close to affordable housing units. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to support a diverse community will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

4.05 - Does the development have the potential to support retrofitting of existing buildings?	
Regeneration projects can serve as a catalyst for financial incentives to support wider environmental improvements. These could be focussed on wider infrastructure improvements or opportunities to improve the environmental performance of existing buildings.	
Compliant / Standard Practice The developer has made a financial contribution to improving the public realm surrounding Smithfield, promoting connectivity and safety at the development boundaries for potential users.	**Relevant Policy / Guidance** • Birmingham Development Plan • New Birmingham Housing Plan
Best Practice The developer has committed to working with BCC to identify funding models and opportunities to retrofit buildings in areas surrounding Smithfield to support wider energy efficiency gains, improving the quality of Birmingham's building stock.	**Relevant Policy / Guidance** • *The redevelopment project in Lyon Confluence supports the refurbishment of existing buildings as part of the national effort to achieve energy targets. The Greater Lyon Climate Plan, co-produced by all local stakeholders, aims to fight the increase in greenhouse gas (GHG) emissions and to shrink the metropolitan area's carbon footprint. In 2005, Greater Lyon set itself targets in line with those pursued by the EU: GHG emissions cut by 20% by 2020, and by 80% by 2050. GHG sources and energy consumers will be identified, as will the development potential of renewable energies; and then concrete measures will be deployed, sector by sector. One priority commitment is housing, which produces 17% of CO_2 emissions.* • *Urban redevelopment is focusing on improving the energy efficiency of existing buildings, which present big energy-efficiency challenges and where upgrades have an even greater economic impact. Refurbishment involves using passive measures such as insulating walls and glazed doors, limiting heat loss (via thermal bridges), etc. to decrease energy consumption.*
Aspirational An assessment of any existing buildings and infrastructure (including their materials) is carried out to determine what can be refurbished, re-used, recycled or maintained. The assessment considers the following: • heritage and local identity; • the location and condition of buildings and infrastructure;	**Relevant Policy / Guidance** • http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

• the embodied carbon in existing materials; • potential uses of buildings and infrastructure; • possible use of materials (on or off-site); • community and local authority knowledge and opinion. The developer commits to refurbishing any existing building or buildings that have been identified as being of significant value to the local community or for sustainability reasons.	

Who is accountable for delivering this?

- Paul McGrath
- Acivico

Link to SDG's:

9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Whole Life Value Assessment

What are the cost implications of compliance? Compliance requires the developer to make a financial contribution to the public realm surrounding Smithfield to support connectivity. This cost may come from land values but will support the quality of the public realm and thus perceptions of the development.
What are the cost implications of moving beyond compliance? There is the potential to incur significant additional cost by examining the potential to retrofit buildings surrounding the development. Smithfield has the potential to serve as a catalyst for investment in the centre of Birmingham and as such options to optimise this should be explored. As per the KPI this includes looking at financial / funding models that could support retrofit efforts that expand the scope of sustainability enhancements beyond just the Smithfield site.
What is the value of moving beyond compliance? There are significant potential lifecycle savings in examining buildings surrounding the Smithfield site that could be suitable for retrofitting.

Whole Life Value		
Economic		
Social		
Environmental		

4.2 Buildings Cost Benefit Analysis

This section attempts to provide a high-level review of potential costs associated with the building programme that could be deployed as part of the Birmingham Smithfield redevelopment to support its ambition of being carbon neutral.

As the development is still at the master plan stage a range of assumptions have been made on the building sizes and designs. The analysis looks at each key question and provides indicative costs for each level of achievement

The cost benefit analysis does not look at how the various technologies can be combined to provide the overall scheme design and each one is taken in isolation. This section provides information about the different models and reports that will provide a building solution, but does not provide analysis of a design for the scheme. Information is provided on each component based on a sizing that is relative to the scheme.

It is recommended that once more detail on the developments design and specification are known a more detailed assessment is undertaken to determine how the various reports and assessments could be implemented.

4.01	Have microclimatic factors influenced the location of building uses and orientation and design of buildings and public realm?							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	A microclimate study has been conducted that identifies current microclimatic conditions and future conditions expected as a result of the proposed development. The findings of the study inform the design of the masterplan. The following factors should be considered: Temperature/thermal comfort; Solar exposure including sky view and shadowing; Air direction, movement and speed; Dust and pollution; Acoustic environment.	report & design				£50/domestic unit (assuming no standalone properties) £1000/non domestic unit (below 5,000m2) £3000/non domestic unit (5,000m2 and above)		Cost of a microclimate report to be commissioned - to include acoustic report - environmental conditions surveys to be carried out
Best Practice	The location of building uses across the site and orientation and design of buildings and public realm respond to the findings of the microclimate study to take advantage of microclimatic conditions. The masterplan demonstrates how positive outcomes will be delivered (e.g. reduced energy demand) as a result of responding to microclimatic conditions.	report & design				£150/domestic unit (assuming no standalone properties) £5,000/non domestic unit (below 5,000m2) £10,000/non domestic unit (5,000m2 and above)		Cost of a microclimate report to be commissioned - to include acoustic report - environmental conditions surveys to be carried out - full physical models of buildings created to test (wind chambers) - value outcome report commissioned
Aspirational	An appropriate and diverse range of favourable microclimatic conditions have been provided throughout the development to cater for a wide range of personal preferences. The design of public space optimises microclimatic conditions at all times of the year. The location and design of pedestrian/cycling routes takes full account of microclimatic conditions.	report & design				£250/domestic unit (assuming no standalone properties) £10,000/non domestic unit (below 5,000m2) £20,000/non domestic unit (5,000m2 and above)		Cost of a microclimate report to be commissioned - to include acoustic report - environmental conditions surveys to be carried out - full physical models of buildings created to test (wind chambers) - value outcome report commissioned - additional design time to reflect and respond to findings in creater depth
4.02	**Will the non-residential buildings within the masterplan deliver high levels of sustainability?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	All non-residential buildings (including education, commercial and student accommodation) are designed to meet BREEAM Excellent or equivalent.	design & construction				add 5% of construction cost for BREEAM Excellent		assumes that in order to achieve BREEAM excellent is the basis of appraisals - in line with Building Regs Very Good is no cost - this will also differ for plots further from transport hubs/district heating/etc.
Best Practice	All non-residential buildings (including education, commercial and student accommodation) are designed to meet at least BREEAM Excellent with at least one building designed to meet BREEAM Outstanding.	design & construction				add 5% of construction cost for BREEAM Excellent - add 10% of construction cost for BREEAM Outstanding		assumes that in order to achieve BREEAM excellent is the basis of appraisals - in line with Building Regs Very Good is no cost - this

								will also differ for plots further from transport hubs/district heating/etc.
Aspirational	Opportunities for alternative building certification standards are explored. This could include The Living Building Challenge.	design & construction				£50/domestic unit (assuming no standalone properties) £1000/non-domestic unit (below 5,000m2) £3000/non domestic unit (5,000m2 and above)		Given new water infrastructure and BREEAM Excellent then most of the Living Well adjustments would be achieved within good design practice - this would therefore be a desktop activity - allow for report per domestic unit/report per non-domestic unit
4.03	**Will the residential buildings within the masterplan deliver high levels of sustainability?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	A commitment is made that all new residential buildings will be assessed against a recognised domestic Certification Standard, including (but not limited to) Home Quality Mark, Passivhaus Where utilising Home Quality Mark, a minimum Rating of 2 Stars is required.	design & construction				3 star - +£3,000 per unit (over 2)		if you want to add passivhaus then this would add £10 - 50,000k per unit (assuming a 2/3 bed unit)
Best Practice	Where utilising Home Quality Mark, a minimum Rating of 4 Stars is required.	design & construction				4 star - +£5,000 per unit (over 2 star)		if you want to add passivhaus then this would add £10 - 50,000k per unit (assuming a 2/3 bed unit)
Aspirational	Where utilising Home Quality Mark, a minimum Rating of 5 Stars is required	design & construction				5 star - +£10,000 per unit (over 2 star)		if you want to add passivhaus then this would add £10 - 50,000k per unit (assuming a 2/3 bed unit)
4.04	**Does the development comprise of a range of housing types, including mixed tenure, to support a diverse community?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The development meets its required affordable housing targets through integrated housing that is mixed and balanced by tenure. Affordable housing includes social rented and intermediate housing. The affordable housing target for Birmingham CC is 50%. Where this is not financially viable the Council will accept a financial contribution to provide affordable housing elsewhere in The City.	planning				20% over affordable housing value?		currently BCC target is lower than this - as such the compliant level will have a financial cost for developers - this could be reflect land cost, construction cost or loss of profit - it would be suggested that the loss of profit on a private scheme would be the most significant cost measure
Best Practice	Affordable housing is integrated throughout the development and is indeterminable from housing for public sale.	design & construction				£1000/unit		A common misconception that affordable housing costs less than public sale - differentiators in terms of kitchen and bathroom fit out are balanced by more robust construction methods and larger room sizes - this is also dependant

								on the starting design for the private sale
Aspirational	The development incorporates XX% of dwellings built in compliance with Approved Document M: Access to and use of buildings.	design & construction				£0/unit		all dwellings will be required to be Part M compliant - if the requirement is meant to reflect fully DDA/lifetime home compliant then this will have a cost as a standard home would increase in size to accommodate
4.05	**Does the development have the potential to support retrofitting of existing buildings?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The developer has committed to working with BCC to identify funding models and opportunities to retrofit buildings in areas surrounding Smithfield to support wider energy efficiency gains, improving the quality of Birmingham's building stock.	survey & report				£ 5000 / building	Consultant cost of time to identify buildings, carry out survey, identify if grant compliant, make application for grant	
Best Practice	The developer has made a financial contribution to improving the public realm surrounding Smithfield, promoting connectivity and safety at the development boundaries for potential users.	design & construction cost				n/a	subjective - could be a % uplift on the proposed public realm or a £/m2 constructed	
Aspirational	An assessment of any existing buildings and infrastructure (including their materials) is carried out to determine what can be refurbished, re-used, recycled or maintained. The assessment considers the following: heritage and local identity; the location and condition of buildings and infrastructure; the embodied carbon in existing materials; potential uses of buildings and infrastructure; possible use of materials (on or off-site); community and local authority knowledge and opinion. The developer commits to refurbishing any existing building or buildings that have been identified as being of significant value to the local community or for sustainability reasons.	survey, report, design & construction cost				£ 5000 / building + cost of refurbishment @ £2,000/m2 GIA	Consultant cost of time to identify buildings, carry out survey, identify if grant compliant, make application for grant, carry out works (this is the subjective portion - you could allow a reasonable £/m2 for this)	

5. Natural Capital

The loss of ecosystem services poses wide ranging threats to our health and wellbeing. Ecosystem services are also linked to economic success, so protecting and enhancing these services is essential to the delivery of long term sustainable outcomes. New development can play a role in protecting and enhancing biodiversity and habitat connectivity. The valuation of these services is often termed as Natural Capital, which is emerging as a key issue on the sustainability agenda. Organisations and developments are demonstrating thought leadership through developing strategies to add value via Natural Capital of which biodiversity is a core value and indicator of Natural Capital Value. Promoting and protecting biodiversity and green infrastructure is also a sustainable design principle core to BCC. To support this, all development options in Birmingham are assessed against the 10 ecosystem services built into the Natural Capital Planning Tool:

- *Harvested products;*
- *Biodiversity;*
- *Aesthetic values;*
- *Recreation;*
- *Water quality regulation;*
- *Flood risk regulation;*
- *Air quality regulation;*
- *Local climate regulation;*
- *Global climate regulation;*
- *Soil contamination.*

5.01 - Will the development deliver an increase in natural capital and habitat connectivity?

It is understood that the site in its current form has a relatively low ecological value and therefore there is an opportunity to increase natural capital. The opportunity to enhance natural capital is greatest when considered at an early stage in the design process.

Compliant / Standard Practice

The masterplan has been designed to ensure there is no net loss in the quality and quantity of natural capital and habitats on site.

The development application will be accompanied by an Ecological Impact Assessment, including an ecological survey and ecological enhancement strategy that have informed the development of the masterplan.

This will include reference to the Birmingham Natural Capital Protocol Tool.

Relevant Policy / Guidance

- Your Green and Healthy City Supplementary Planning Document
- Demystifying Green Infrastructure (UKGBC 2015)
- Victoria Improvement District Best Practice Guide
- Birmingham and Black Country BAP (2010)
- The Birmingham Development Plan (BDP) 2013 particularly
  - Policy TP2 Adapting to climate change
  - Policy TP3 Sustainable construction
  - Policy TP8 Biodiversity and Geodiversity

Best Practice

Compliant / Standard Practice PLUS:

The masterplan has been designed to ensure that the development will deliver a net gain in in the quality and quantity of ecosystem services and habitats on site.

Relevant Policy / Guidance

- Natural Capital Protocol
- Birmingham Natural Capital Tool

Aspirational

Individual development options are assessed to consider how development options retain and protect existing biodiversity “assets”.

Where the conclusion is that individual proposals do not retain and protect existing features, the loss of the assets be adequately compensated for, in order to achieve a net positive impact.

This is agreed against a baseline against which to assess option performance, particularly in terms of increased biodiversity and habitat connectivity.

In addition, space is provided for food growing opportunities across and throughout the development; for both residents use (small scale) and for commercial use (large scale).

Relevant Policy / Guidance

- Natural Capital Protocol
- Birmingham Natural Capital Tool
- As per Montreal Canada, http://citiscope.org/story/2014/can-urban-agriculture-work-commercial-scale; and Birmingham’s sister city Chicago, http://farmedhere.com/

Who is accountable for delivering this?

- Nick Grayson / Nicola Farrin

Link to SDG's:

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Whole Life Value Assessment

What are the cost implications of compliance? Retaining biodiversity value on site should not represent a significant additional capital cost unless protected species are identified. Where any potentially protected species are identified, additional time and cost may be incurred in ensuring their safe removal / relocation from site. The site is currently notionally of low biodiversity value, but grey field sites have been demonstrated to have considerable biodiversity value.

In addressing this, the development will be required to undertake an Environmental Impact Assessment (EIA) for planning. There may be a slight increase in the professional fees associated with completing this to address ecological value. The delivery of a strategy to deliver ecological enhancement has the potential to increase professional fees and where the strategies are taken forwards in the design a notional increase in capital cost may be required.

What are the cost implications of moving beyond compliance? It is not considered that moving beyond compliance will represent a significant additional cost to the development but this is dependent on the strategies required to deliver a net gain in the quality and quantity of biodiversity on site. Within this context there may also be a slight uplift in maintenance cost.

What is the value of moving beyond compliance? Biodiversity value is increasingly seen as an integral feature in sustainable developments. As such providing ecological enhancement can improve the quality of the site. This has the potential to improve amenity value of usable space for site users. At a local level, insect levels may rise giving rise to a perception of risk but this is considered to be low.

It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for biodiversity and habitat connectivity will be predominantly environmental and social.

Whole Life Value		
Economic		
Social		
Environmental		

wbcsd

5.02 - Will the development deliver green roofs and walls that maximise the opportunity for enhancing natural capital?

Green roofs and walls provide an opportunity to enhance natural capital at a building level and can also offer a number of additional benefits to the development. These include storm water attenuation, reduction of the urban heat island effect and visual amenity. Competition for roof space should be discussed as there may be demand for roof space from micro renewables e.g. PV, blue roofs, building services and amenity space. It should be noted that PV and solar thermal installations can be located on green roofs in order to share the same space.

Compliant / Standard Practice

The development will create additional opportunities for enhancing natural capital through incorporating green roofs and walls.

Relevant Policy / Guidance

- The Birmingham and Black Country BAP (2010)
- National Planning Policy Framework (2012)

Best Practice

Compliant / Standard Practice PLUS:

The specification and design of green roofs and green walls (ensuring sustainability re water demand) will support the objectives and targets of Biodiversity Action Plans (BAPs) / Birmingham Natural Capital Protocol, relevant to the site.

Green roofs and green walls should prioritise native/adaptive species and demonstrate a focus on enhancing natural capital through specification and planting. They should also seek to maximise water resource efficiency designed to be drought resistant/resilient. .

Relevant Policy / Guidance

- http://livingroofs.org/
- http://www.greenroofguide.co.uk/
- Birmingham New Street case study – green wall
- http://www.gabionbasket.org/gabions/gravity-walls.html
- the “green library” green roof case study http://www.libraryofbirmingham.com/article/designandconstruction/greenlibrary

Aspirational

Best Practice PLUS consider the inclusion for natural capital. and integrated green infrastructure throughout the ‘development plan’ not to be seen as a stand-alone landscape plan; that this should maximise the potential benefits to be accrued from urban green infrastructure on walls, roofs and throughout the built environment; http://grupo.us.es/naturib/wp-content/uploads/2015/01/Paper-online.pdf.

Relevant Policy / Guidance

- The Birmingham and Black Country BAP (2010)
- National Planning Policy Framework (2012)
- See European best practice guide http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2011/04/MDR0763Rp00013_Good-Practice_Final2.pdf

Who is accountable for delivering this?

- Nick Grayson / Nicola Farrin

Link to SDG's:

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation

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15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Whole Life Value Assessment

What are the cost implications of compliance? Green walls represent an additional capital cost to normal building facades. Dependent on the extent of green wall they may require additional engineering due to loads and water proofing etc. They also require maintenance and as such additional cost will be incurred. Green roofs can reduce the amount of usable roof space for other uses, such as building services and renewables, and by displacing mechanical services plant from the roof to other parts of the building will result in either a loss of space for other uses or a larger building at additional cost. Dependent on the design they may require additional load bearing designed into the building engineering. Typically speaking sedum roofs require little to no maintenance. More intensive solutions may require maintenance.

What are the cost implications of moving beyond compliance? Green roofs and walls can support biodiversity value and as such, within the context of a Biodiversity Action Plan, will support the objectives for enhancement at the site level. As such they will represent an additional cost but should be considered a design solution. As above it is considered that to meet these objectives a more intensive green roof / wall specification may be required beyond a simple sedum roof. This may be more expensive to deliver and may require maintenance.

What is the value of moving beyond compliance? Green walls and roofs are a visual representation of a buildings green credentials. They are also a design solution to reduce surface water run-off, improve building efficiency and biodiversity enhancement. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for green roofs and walls will be predominantly environmental.

Whole Life Value		
Economic		
Social		
Environmental		

5.03 - Will the landscape plan set out to enhance natural capital?

The landscape plan and planting specification has the opportunity to enhance natural capital and can support the objectives and targets of Biodiversity Action Plans (BAPs) relevant to the site. In order to achieve this, enhancing natural capital should be a key principle in the development of the landscape plan.

Compliant / Standard Practice

The landscape plan will incorporate plans for enhancing natural capital through the proposed layout, design and planting scheme.

Relevant Policy / Guidance

- National Planning Policy Framework (2012) http://www.landscapeinstitute.org/policy/GreenInfrastructure.php

Best Practice

Creating spaces that are valuable to people whilst optimising the opportunity for enhancing natural capital will be a key objective of the landscape plan and will guide decision making from the beginning of the design process.

The landscape plan will support the objectives and targets of Biodiversity Action Plans (BAPs) / the Birmingham Natural Capital Protocol relevant to the site.

Relevant Policy / Guidance

- CIRIA 2011 Delivering biodiversity benefits through green infrastructure
- Natural England Green Infrastructure Guidance 2009 (Catalogue Code: NE176)
- Lombardi et al. Designing Resilient Cities: A guide to good practice

Aspirational

Best Practice PLUS consider the inclusion for natural capital. and integrated green infrastructure throughout the 'development plan' not to be seen as a stand-alone landscape plan; that this should maximise the potential benefits to be accrued from urban green infrastructure on walls, roofs and throughout the built environment; http://grupo.us.es/naturib/wp-content/uploads/2015/01/Paper-online.pdf;

Relevant Policy / Guidance

- See European best practice guide http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2011/04/MDR0763Rp00013_Good-Practice_Final2.pdf

Who is accountable for delivering this?

- Nick Grayson / Nicola Farrin

Link to SDG's:

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

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15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Whole Life Value Assessment

What are the cost implications of compliance? The specification of a planting strategy that responds to the aims of biodiversity enhancement should incur no or very little additional capital cost. There might be a slight increase in maintenance cost. However, where the specification of planting specifies plants that require minimal watering or maintenance there may be a reduction in maintenance cost.
What are the cost implications of moving beyond compliance? The public realm strategy will ensure space is usable for site users. Supporting infrastructure may incur slight additional capital and maintenance cost but this should be considered in light of amenity value. How this responds to the Biodiversity Action Plan will dictate these costs. Where the plants / enhancements specified are particularly rare or difficult to obtain there may be an additional cost. However, it is anticipated that these will be readily available and will represent a small if not no additional cost.
What is the value of moving beyond compliance? Biodiversity value is a trend in sustainability and is attracting an increasing level of attention. Biodiversity and ecological enhancement at a site level contributes to perceptions of environmental quality. Where this is integrated into public space can support amenity value. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for landscape to enhance biodiversity will be environmental and social.

Whole Life Value		
Economic		
Social		
Environmental		

5.04 - Does the landscape strategy promote water efficiency?

The landscape strategy should reduce the need for additional water consumption through the principles of xeriscaping.

Compliant / Standard Practice

The requirement for the irrigation of green infrastructure will be considered at the beginning of the design stage

Relevant Policy / Guidance

- National Planning Policy Framework (2012)

Best Practice

The design of green infrastructure must reflect the sustainable water resources available and will set targets for rain water harvesting, grey water usage and net requirements for potable water

Relevant Policy / Guidance

- CIRIA Water Sensitive Urban Design http://www.ciria.org/Resources/Free_publications/Water_Sensitive_Urban_Design.aspx
- http://www.landscapeinstitute.org/knowledge/Landscapeandwater.php

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Nick Grayson / Nicola Farrin

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15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Whole Life Value Assessment

What are the cost implications of compliance? The cost of compliance will be minimal and has the potential to deliver significant lifecycle savings through utilising more efficient water management. Understanding what the landscaping strategy requires by way of green infrastructure and how this is to be maintained will deliver economic value through minimising the need to maintain intensively and social value in delivering a high quality landscape.
What are the cost implications of moving beyond compliance? Ensuring the green infrastructure is resilient to the potential impacts of climate change will reduce the need for intensive watering. Where any required watering can be provided from recycled sources will support efficiency targets.
What is the value of moving beyond compliance? Water efficiency will reduce operational costs and deliver wider environmental gains.

Whole Life Value		
Economic		
Social		
Environmental		

5.05 - Does the landscape strategy promote biodiversity?

The landscape strategy should protect and enhance biodiversity.

Compliant / Standard Practice

The landscape strategy will consider biodiversity in design and the net increase in biodiversity will be documented.

Relevant Policy / Guidance

- National Planning Policy Framework (2012)

Best Practice

The landscape strategy will be co designed with an ecologist and will set targets for net increase in biodiversity this will include a management plan. Sample habitats will be monitored to confirm success.

Relevant Policy / Guidance

- CIRIA 2011 Delivering biodiversity benefits through green infrastructure
- http://www.designingbuildings.co.uk/wiki/Biodiversity_in_the_urban_environment
- T. Beatley (2011) Biophilic Cities, Integrating Nature into Urban Design and Planning
-

Aspirational

Best Practice PLUS to go beyond the landscape strategy and be comprehensive throughout the development strategy; so matching the Biophilic aspirations from Singapore - https://www.ura.gov.sg/uol/publications/research-resources/books-videos/2013-11_vertical_garden_city_sg.aspx;

Relevant Policy / Guidance

- Natural Capital Protocol
- Birmingham Natural Capital Tool

Who is accountable for delivering this?

- Nick Grayson
- Nicola Farrin

Link to SDG's:

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation

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15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Whole Life Value Assessment

What are the cost implications of compliance? The promotion of natural capital can support the delivery of biodiversity gains and vice versa, although the disciplines should still be considered to be complimentary but different. The cost of considering this in design is minimal. The additional skills required to deliver this may incur some additional cost in the design process but the solutions will support the developments wider sustainability objectives.
What are the cost implications of moving beyond compliance? As part of the strategy for delivering enhancements in the ecological value of the site the development should seek to conserve any additional ecological value that is created. The level of ambition will depend on what is technically feasible within the constraints of the site.
What is the value of moving beyond compliance? Our natural environment is under increasing pressure. Any effort to protect and enhance these features should be explored. This fits with the wider Natural Capital objectives of Birmingham City Council to be recognised in this area.

Whole Life Value		
Economic		
Social		
Environmental		

5.2 Natural Capital Cost Benefit Analysis

Natural capital design including integrated street level green infrastructure and natural capital design options are consistent with a number of ZEC framework principles as indicated in the table below. Amongst other features green roofs, rain gardens and pocket parks contribute to the framework principles within energy and climate, water, natural capital, community and culture and well-being principles and as such can be seen as an important constituent of any design that aims to improve environmental and social aspects of development. Table 1 show these points of integration.

Table 1: Natural capital design benefits supporting the ZEC framework

		NC Design Options		
No.	Framework Principles	**Green roof**	**Rain garden**	**Pocket park**
	Energy and Climate Action			
1.02	Has the masterplan been designed to reduce energy consumption?			
1.05	Will the design of the development consider and respond to the predicted impacts of climate change?			
1.06	Will the development incorporate measures to avoid overheating and reduce the urban heat island effect?			
1.07	Will the development result in an increase in urban greening?			
	Water			
2.03	Has the development been designed to incorporate rainwater / greywater harvesting?			
2.05	What measures have been taken to support the cleaning of Birmingham's waterways?			
2.07	To what extent has the development been designed to attenuate surface water runoff?			
	Buildings			
4.02	Will the non-residential buildings within the masterplan deliver high levels of sustainability?			
4.03	Will the residential buildings within the masterplan deliver high levels of sustainability?			
	Natural Capital			
5.01	Will the development deliver an increase in natural capital and habitat connectivity?			

		NC Design Options		
No.	Framework Principles	**Green roof**	**Rain garden**	**Pocket park**
5.02	Will the development deliver green roofs and walls that maximise the opportunity for enhancing natural capital?			
5.03	Will the landscape plan set out to enhance natural capital?			
5.04	Does the landscape strategy promote water efficiency?			
5.05	Does the landscape strategy promote biodiversity?			
	Community & Culture			
8.04	Does the masterplan contribute to the provision of necessary community meeting space for the future population and local community?			
8.05	Will partners support the education of residents as to the sustainability features of the new development?			
8.08	Does the public realm incorporate local art / sculptures?			
	Health & Well-being			
10.02	Will the development result in improved leisure, recreation, sport and fitness facilities for the local area?			
10.03	How does the masterplan address air quality?			
10.04	To what extent has the impact of noise been considered in the masterplan?			
10.06	Are there opportunities for the provision of local food suppliers?			

These design solutions provide a range of benefits, as detailed below.

Benefit	Green roof	Rain garden	Pocket park
Storm water amelioration	Green roofs store rainwater in the plants and growing mediums and evaporate water into the atmosphere. The amount of water that is stored on a green roof is dependent on the growing medium, its depth and the type of plants used. In summer, green roofs can retain 70-80% of rainfall and in winter they retain between 25-40%.	Rain gardens absorb the rainwater runoff from impervious urban areas. This reduces rain runoff by allowing stormwater to soak into the ground. Their water attenuation potential depends on a number of factors from soil conditions, plats. etc.	Pocket parks with their extensive vegetative cover that includes trees, shrubs, flower beds and grass can significantly reduce the stormwater runoff. The amount of water attenuated depends on the soil conditions, type of vegetative cover. They can retain considerable amount of water.
Reduction in flooding	Green roofs reduce the volume and flows of run off into the drainage system, which can reduce the frequency and/or severity of flooding and hence reduces damages damage to property and human life (Horton et al., 2016; CNT, 2010).	By attenuating water run-off rain gardens can help mitigate flooding and hence reduce the damages of flooding.	Pocket parks reduce flows of water into the drainage system and hence reduce the frequency and/or severity of flooding (Horton et al., 2016; CNT, 2010).
Reduction in water treatment needs	By attenuating runoff, green roofs reduce the volumes of water that need to be treated in water treatment works reducing energy consumption as well as reducing the need to build grey infrastructure in the first place (Horton et al., 2016).	By attenuating runoff, rain gardens generally lead to lower volumes of water that need to be treated in water treatment works (Horton et al., 2016).	Pocket parks reduce the volumes of water that need to be treated in water treatment works reducing energy consumption and reducing the need to build grey infrastructure (Horton et al., 2016).
Water quality	Green roofs remove heavy metals, airborne particles and volatile organic compounds which do not enter the water system through surface run off and thus improve water quality. Improvement in water quality can lead to a number of benefits including aesthetic, health or improve habitats (Horton et al., 2016, EFB, Green Roofs).	Rain gardens improve water quality in nearby bodies of water and ensure that rainwater becomes available for plants as groundwater rather than being sent through stormwater drains straight out to sea.	Pocket parks to even greater extent than rain gardens improve the water quality as their vegetation can be much more diverse and usual can span over a larger area.
Air quality	Green roofs contribute to the reduction of a number of polluting air particles and compounds not only through the plants themselves, but also by deposition in the growing medium itself. Green roofs remove	Similarly, to green roofs rain gardens can improve the air quality by removing air polluting particles.	Trees are very effective in absorbing or removing pollutants, such as nitrogen dioxide (NO2), sulphur dioxide (SO2), particulates (PM10) and ozone (O3). A study by Pugh et al., (2012) shows that increasing deposition by the

Benefit	Green roof	Rain garden	Pocket park
	PM10 particles, heavy metals, airborne particles, and volatile organic compounds (EFB).		planting of vegetation in street canyons can reduce street-level concentrations in those canyons by as much as 40% for NO2 and 60% for PM (Baldauf et al., 2013; Horton et al., 2016).
Building energy consumption	Green roof systems provide greater thermal performance and roof insulation for the buildings. This can vary depending on the time of the year, and the amount of water held within the system. A green roof not only acts as an insulation barrier, but the combination of plant processes and soil processes reduces the amount of solar energy absorbed by the roof membrane, thus leading to cooler temperatures beneath the surface. Research by Nottingham Trent University has shown that green roofs perform better in winter and summer months compared to conventional roofs (EFB).	No direct impact.	No direct impact.
Urban heat island effect	Urban areas have large areas of hard reflective surfaces which absorb solar radiation and reflect this heat back into the atmosphere. Any reduction in this effect can have a positive effect on air pollution. Collectively a large areas of green roofs in specific areas of large cities could have a noticeable effect (EFB, Green Roofs).	Rain gardens can reduce the reduce the local temperatures[1] by reflecting the sunlight.	Establishing a park can reduce the temperatures in surrounding areas. Research by NASA in Atlanta has compared temperatures of different surfaces. Their findings show that with the outside air temperature of 25°C the temperature in tree shaded grass was 28°C, in tree canopy 21°C, on Asphalt in full sun 50°C (EFB).
Reduction in GHG emissions	Green roofs indirectly reduce GHG emissions as a result of lower building energy consumption and lower water treatment needs.	No direct impact.	No direct impact.
Carbon sequestration	Plants reduce carbon dioxide in the atmosphere and produce oxygen.	Plants remove CO2 from the atmosphere and store it in the soil carbon pool. This process is primarily mediated by plants through	Trees have considerable potential to store carbon. A small tree can store as much as 146

[1] http://www.aila.org.au/imis_prod/documents/AILA/Governance/Position%20Statement%20Cool%20Cities_for%20review_final.pdf

Benefit	Green roof	Rain garden	Pocket park
		photosynthesis, with carbon stored in the form of soil organic carbon (SOC), known often as Carbon Capture and Storage (CCS). Together the soil and vegetation have the capacity to attenuate carbon (Ontl et al. 2012; Horton et al., 2016; CNT, 2010).	kgCO_2 while a large ca tree can store more than twice as much CNT, 2010).
Noise pollution	The combination of soil, plants and trapped layers of air within green roof systems can act as a sound insulation barrier. The growing medium tends to block lower sound frequencies whilst the plants block higher frequencies. The amount of sound insulation is dependent on the system used and the substrate depth. A green roof with a 12 cm substrate layer can reduce sound by 40dB and one of 20 cm by 46-50dB. As a result a green roof can reduce sound by 8dB compared with a conventional roof system (Peck et al. 1999).	Soil and vegetation help reduce sound transmission, thus reducing local noise pollution levels (CNT, 2010). In this regard rain gardens can contribute to reducing noise pollution.	According to the World Health Organization, noise pollution is nowadays the third most hazardous environmental type of pollution, preceded only by air (gas emission) and water pollution (Khilman, 2004). Since the seventies, “noise” has been largely considered as a major problem of annoyance in cities. Parks can reduce noise pollution through natural sound absorption capacity. In one model the substrate materials modelled (i.e. those used to provide a surface for plant growth) accounted for most of the noise reduction seen in the simulations. Trees also play particularly important role in reducing noise pollution levels (Alliance for Community of trees).
Aesthetics	Green roofs can provide both visually accessible and physically accessible green space. Roofs are largely visually 'dead' and unappealing and their appearance to those overlooking them can be softened by vegetation. There are instances where the sole justification of a green roof installation is for visual aesthetics. Areas of green roofs can also provide accessible space for people to enjoy, and some can be landscaped to extend existing green space.	Rain gardens can have a positive effect on the attractiveness and desirability of an area as they improve the well-being and can also increase property values (Horton et al, 2016).	Pocket parks provide beauty and privacy, which improve community aesthetics. Planting trees increases recreational opportunities for communities by improving pathways, creating places to gather and providing shade during warm weather. Parks and green spaces also contribute to an increase in property prices (Horton et al., 2016; CNT, 2010).

Benefit	Green roof	Rain garden	Pocket park
Health & Wellbeing	The visual and physical contact with natural greenery provides a range of benefits to people including mental (such as reduction of stress) and physical benefits (e.g. the provision of cleaner air). Access to green space can bring about direct reductions in a person's heart rate and blood-pressure, and can aid general well-being. A Texan study of post-surgery recovery in hospitals demonstrated that recovery was quicker and with less chance of relapse if patients could look out onto green space. A number of American hospitals have subsequently been redesigned to bring these benefits to patients. A roof on the Kanton Hospital in Basel was redesigned 20 years ago by vegetating it, because it was felt that patients in intensive care would benefit from looking out onto this rather than the grey-space of before. A few community hospitals in the UK are now being designed with a greater consideration of green-space provision (EFB).	By providing additional green areas rain gardens do improve the well-being of people by improving physical, emotional, and mental health.	Pocket parks extend the green areas within the urban areas and can have significant positive impact on the wellbeing of people by enabling them to enjoy various activities in nature (Kirby et al., 2015; Horton et al., 2016).
Recreation	Green roof have the potential to provide recreational opportunities for people (EFB).	Rain gardens can provide recreational benefits, particularly if they are designed near walking and cycling paths and where they are specifically designed with a dual recreational purpose (Horton et al., 2016).	Pocket parks with trees increase recreational opportunities for communities by improving pathways, creating places to gather and providing shade during warm weather (CNT, 2010).
Educational opportunities	Green roofs on educational facilities can provide an easily accessible sight to teach students and visitors about biology, green roof technology, and the benefits of green roofs.	Green spaces provide an opportunity to develop community awareness and understanding around the importance of nature.	Creating green areas and planting trees can provide a valuable educational opportunity for residents to become more aware of the benefits of green infrastructure.
Urban agriculture	Using green roofs as a site for urban agriculture projects can reduce a community's urban footprint through the creation of a local food system. These projects can serve as a	As with green roofs rain gardens can provide opportunity for urban agriculture and urban foraging.	Pocket parks can provide increased opportunities for urban agriculture and urban foraging.

Benefit	Green roof	Rain garden	Pocket park
	source of community empowerment, give increased feelings of self-reliance (Michigan State University, Green Roofs, EFB).		
Biodiversity	Green roofs are intrinsically of greater benefit to biodiversity than more traditional roofing methods; however, they need to be designed to meet specific local biodiversity conservation objectives. Green roofs can sustain a variety of plants and invertebrates, and provide a habitat for various bird species. By acting as a stepping stone habitat for migrating species they can link species together that would otherwise be fragmented. Through increased diversity ecosystems are better able to maintain high levels of productivity during periods of environmental variation than those with fewer species (EFB, Green Roofs).	Rain gardens make a significant contribution to the biodiversity (ecological) value of an area by providing connectivity between habitats and provide habitats for many species. Biodiversity also increases the resilience of the functional elements of natural capital (Isbell et al., 2015; Horton et al., 2016).	Pocket parks can provide an important feature in urban environment that improve habitats, which provides living space for both resident and migratory species and provide nurseries for species which live their adult lives elsewhere.
Marketing	Green roofs can increase a building's marketability. They are an easily identifiable symbol of the green building movement and can act as an incentive to those interested in the multiple benefits offered by green roofs. Green roofs, as part of the green building movement, have been identified as facilitating (Wilson 2005): Sales, Lease outs, Increased property value due to increased efficiency.	Residential housing developments with green areas are more attractive to live in and this presents developers with an opportunity to sell the properties more easily.	Parks and green areas improve the attractiveness of developments and can thus improve the attractiveness of developments.
Shorter delays in the application process	Incorporating green roofs features does assist with expediting planning applications and can prevent them from being rejected.	Similar benefits to green roofs.	Similar benefits to green roofs.
Ecosystem resilience	Green roofs can provide, if part of a wider green network, improvement in biodiversity characteristics and increase the resilience of the wider ecosystem.	Green areas that increase biodiversity buffers ecosystems against climate extremes, and make ecosystems more resilient and can	Pocket parks and green areas can increase the size of natural networks and improve the biodiversity richness and hence can improve the resilience of ecosystems.

Benefit	Green roof	Rain garden	Pocket park
		recover more quickly after shocks, such as drought, (Isbell et al., 2015).	

The table below demonstrates potential scale of benefits provided by different natural capital design options.

Table 2: Potential benefits of natural capital design options

Benefit	**Green roofs**	**Rain gardens**	**Pocket parks**
Regulating			
Storm water attenuation	Medium	High	High
Reduction in flooding	Medium	High	High
Reduction of water treatment needs	Medium	High	High
Improved water quality	High	High	High
Reduced noise pollution	High	Medium	High
Improved air quality	Medium	High	High
Reduced building energy consumption	High	*	*
Reduced building GHG emissions	High	*	*
Carbon sequestration	Medium	High	High
Reduced urban heat island	High	Medium	High
Cultural			
Health and wellbeing	Medium	Medium	High

Benefit	Green roofs	Rain gardens	Pocket parks
Improved aesthetics	High	High	High
Increased recreational opportunities	Low	Medium	High
Provided educational opportunities	Low	Medium	High
Supporting			
Improvement in habitat (biodiversity)	Medium	Medium	High
Provisioning			
Urban agriculture	Low	Low	Low
Other benefits			
Marketing opportunities	Medium	High	High
Less delays in the application process	Medium	Medium	Medium
Ecosystem resilience	Low	Low	Medium

* Contribute to reduced energy consumption and associated emissions from water treatment

Source: CNT (2010), Horton et al. (2016), Arcadis

The monetary values of benefits provided by selected Natural capital design options are summarised within Table 3.

The monetary values are an approximation of the benefits provided and were derived using a range of different data and methods. As a number of benefits could not be captured in monetary terms the benefits are likely to be underestimated and one needs to consider other non-monetary benefits (presented in sections 5.2.1.2, 5.3.1.2 and 5.4.1.2) to form a comprehensive picture of the likely benefits.

Table 3: Total monetised values of selected natural capital design options

Benefits £ per m^2 per year	Green roof	Rain garden	Pocket park
Regulating			
Reduction in water treatment cost	0.03	0.04	0.04
Improvement in air quality	0.03	0.02	1.27
Carbon sequestration	0.00	0.15	1.55
Reduction in GHG emissions	0.26	0.02	0.02
Reduction in building energy use	0.65	0.00	0.00
Cultural			
Amenity (impact on property values)	0.00	3.13	6.49
Recreation	0.02	0.04	0.10
Supporting			
Habitat improvement	0.02	0.18	0.48
Total	**1.01**	**3.58**	**9.94**

**NB: The values presented provide an indicative, but not comprehensive value of some of the natural capital benefits provided by selected natural capital design options. Some benefits may be under and other overvalued. Please refer to the Section 5.1 for description of the benefits and sections 5.2.1.2, 5.3.1.2 and 5.4.1.2 for more information regarding which benefits are not monetised. These data are however relevant within the context assessed.*

These values presented in the table are standalone and do not account for any efficiencies and synergies that a combination within the treatment train would provide.

One should also note that the identified Natural capital design options perform different but sometimes complementary functions that depend on the landscape and design features (e.g. green roofs cover buildings while permeable pavement used for connectivity/access). For this reason, benefits should not be directly compared, particularly as not all benefits can be valued due to lack of robust and transferable data associated with the benefits measurement.

Some of the above mentioned benefits will accrue as private benefits (e.g. building energy use will benefit residents directly), while other will benefit wider society (e.g. improvement in habitat, reduction in GHG emissions). However, all of these benefits (including the ones that could not be expressed in monetary terms) should be appropriately considered when deciding between natural capital and conventional solutions.

Comparison of natural capital design options with business as usual

This section assesses the cost and benefits of green roofs, rain gardens and pocket parks with business as usual (BAU) scenarios.

Green roofs

Green roofs provide several benefits compared to a conventional roof. While they may be more expensive to construct and maintain their annual social and private benefits outweigh higher costs. Taking both type of benefits into account green roofs have payback time of just above 3 years. The costs and benefits are presented in the table and the figure below.

Table 4: Annual monetised cost and benefits of a green roof and a BAU scenario

Cost/Benefits £ per m^2 per year	Green Roof	Conventional roof
Costs		
Capex	3.17	2.77
Maintenance	0.01	0
Benefits		
Regulating		
Reduction in water treatment cost	0.03	0.00
Improvement in air quality	0.03	0.00

Carbon sequestration	0.00	0.00
Reduction in GHG emissions	0.26	0.00
Reduction in building energy use	0.65	0.00
Cultural		
Amenity (property values)	0.00	0.00
Recreation	0.02	0.00
Supporting		
Habitat improvement	0.02	0.00
Total	**1.01**	**0.00**
Non monetised benefits		
Reduction in flooding	x	
Water quality	x	
Urban heat island effect	x	
Noise pollution	x	
Health and Wellbeing	x	
Education	x	
Urban agriculture	x	

Marketing	x	
Less delay in planning application process	x	
Ecosystem resilience	x	

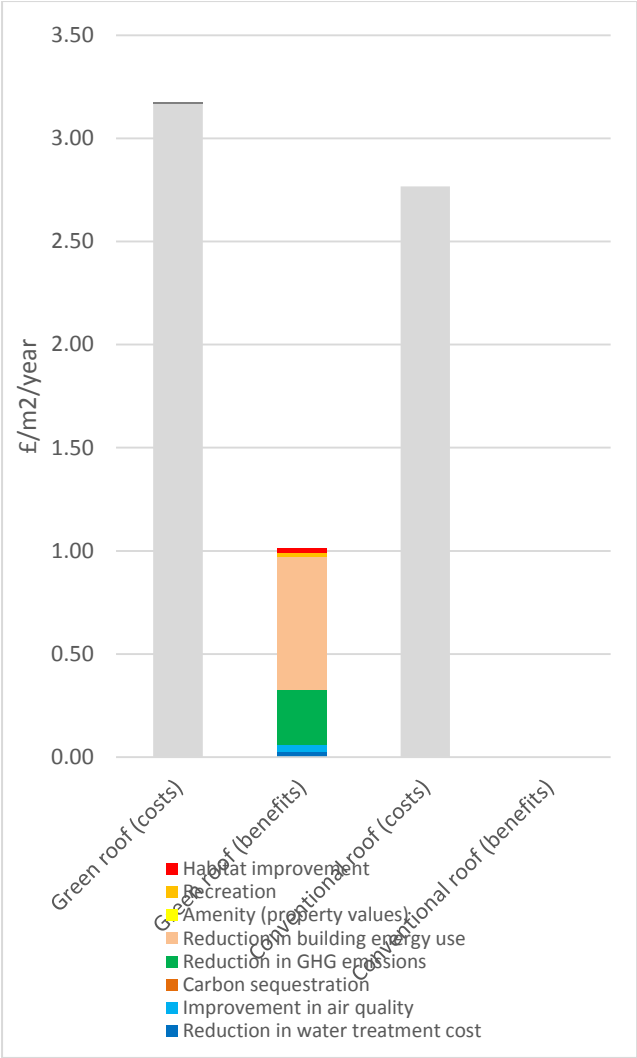
**NB:*

1. Capex and maintenance costs presented are annualised and spread over 30 years for both scenarios. Both types of costs are generic and can vary across applications.

2. The values presented provide an indicative, but not comprehensive value of some of the natural capital benefits provided by selected natural capital design options. Some benefits may be under and other overvalued. Please refer to the Section 5.1 for a more description of the benefits and sections 5.2.1.2 for more information regarding the non-monetised benefits and should also be considered before making decisions. These data are however relevant within the context assessed.

3. The results are sensitive to assumptions and the input parameters used in the calculation, such as lifespan, capex and maintenance cost. This can vary from project to project and can affect its feasibility.

Figure 1: Annualised benefits and costs of green and conventional roofs



NB: Not monetised benefits are not included in the figure

Rain gardens

Rain gardens provide several benefits compared to a permeable pavement with individually planted plants/trees. While they may be more expensive to construct and maintain their annual social and private benefits outweigh higher costs. Taking both type of benefits into account rain gardens have payback time of less than a year. The costs and benefits are presented in the table and the figure below.

Table 5: Annual monetised cost and benefits of a rain garden and a BAU scenario

Cost/Benefits (£ per m^2 per year)	Rain garden	Permeable pavement with individually planted plants/trees
Costs		
Capex	2.67	1.8
Maintenance	0.003	0.002
Benefits		
Regulating		
Reduction in water treatment cost	0.04	0.04
Improvement in air quality	0.02	0
Carbon sequestration	0.15	0.01
Reduction in GHG emissions	0.02	0.00
Reduction in building energy use	0.00	0.00
Cultural		

Cost/Benefits (£ per m^2 per year)	Rain garden	Permeable pavement with individually planted plants/trees
Amenity (property values)	3.13	0.00
Recreation	0.04	0.00
Supporting		
Habitat improvement	0.18	0.02
Total	**3.58**	**0.07**
Non Monetised Benefits		
Reduction in flooding	x	x
Water quality	x	x
Urban heat island effect	x	x
Health and Wellbeing	x	
Noise pollution	x	
Educational opportunities	x	
Urban agriculture	x	
Marketing	x	

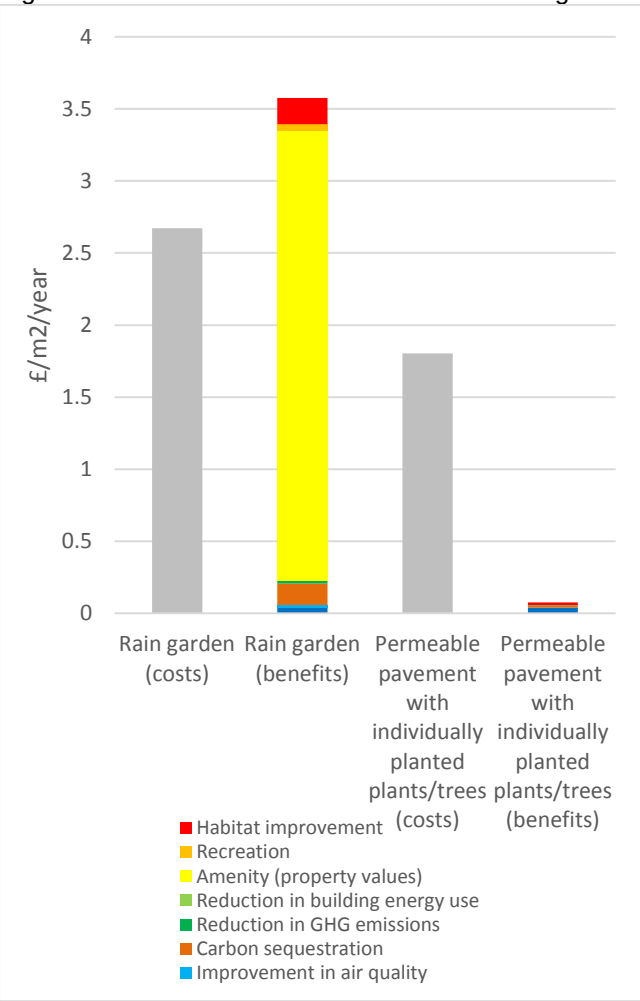
Cost/Benefits (£ per m^2 per year)	Rain garden	Permeable pavement with individually planted plants/trees
No delays in the application process	x	
Ecosystem resilience	x	

*NB:

1. Capex and maintenance costs presented are annualised and spread over 30 years for both scenarios. Both types of costs are generic and can vary across applications.

2. The values presented provide an indicative, but not comprehensive value of some of the natural capital benefits provided by selected natural capital design options. Some benefits may be under and other overvalued. Please refer to the Section 5.1 for a more description of the benefits and sections 5.3.1.2 for more information regarding the non-monetised benefits. These benefits should also be considered before making decisions. These data are however relevant within the context assessed.

Figure 2: Annualised benefits and costs of rain gardens and permeable pavements



NB: Not monetised benefits are not included in the figure.

NB: Maintenance costs of permeable pavement under presented.

Pocket parks

Pocket parks provide several benefits compared to a permeable pavement with individually planted plants/trees. While they may be more expensive to construct and maintain their annual social and private benefits outweigh higher costs. Taking both type of benefits into account green roofs have payback time of less than a year. The costs and benefits are presented in the table and the figure below.

Table 6: Annual monetised cost and benefits of a pocket park and a BAU scenario

Costs/Benefits£ per m^2 per year	Pocket park	Permeable pavement with individually planted plants/trees
Costs		
Capex	2.91	2.40
Maintenance	0.27	0.00
Benefits		
Regulating		
Reduction in water treatment cost	0.04	0.04
Improvement in air quality	1.27	0
Carbon sequestration	1.55	0.01
Reduction in GHG emissions	0.02	0.00
Reduction in building energy use	0.00	0.00
Cultural		

Costs/Benefits£ per m^2 per year	Pocket park	Permeable pavement with individually planted plants/trees
Amenity (property values)	6.49	0.00
Recreation	0.10	0.00
Supporting		
Habitat improvement	0.48	0.02
Total	**9.94**	**0.07**
Non Monetised Benefits		
Reduction in flooding	x	x
Water quality	x	x
Urban heat island effect	x	x
Health and Wellbeing	x	
Noise pollution	x	
Educational opportunities	x	
Urban agriculture	x	
Marketing	x	
No delays in the application process	x	

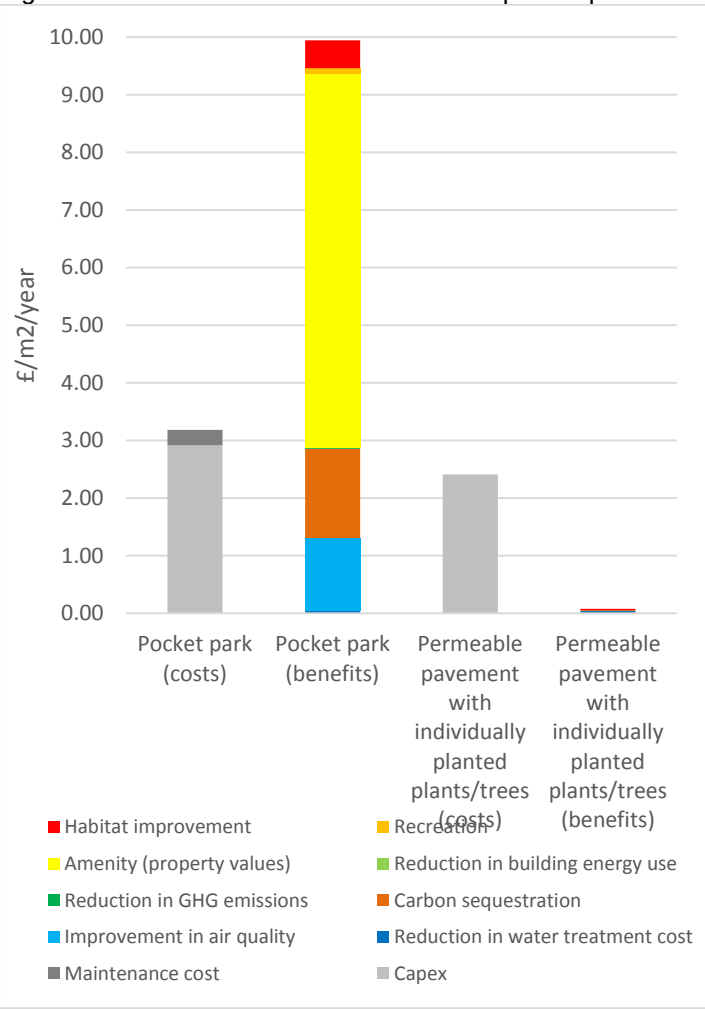
Costs/Benefits£ per m^2 per year	Pocket park	Permeable pavement with individually planted plants/trees
Ecosystem resilience	x	

*NB:

1. Capex and maintenance costs presented are annualised and spread over 40 years for both scenarios. Both types of costs are generic and can vary across applications. It is assumed that permeable pavement will need some replacement after 30 years.

2. The values presented provide an indicative, but not comprehensive value of some of the natural capital benefits provided by selected natural capital design options. Some benefits may be under and other overvalued. Please refer to the Section 5.1 for a more description of the benefits and sections 5.4.1.2 for more information regarding the non-monetised benefits. These benefits should also be considered before making decisions. These data are however relevant within the context assessed.

Figure 3: Annualised benefits and costs of pocket parks and permeable pavements



NB: Not monetised benefits are not included in the figure.
NB: Maintenance costs of permeable pavement under presented

6. Transport and Accessibility

Promoting sustainable transport choices in development users can support significant sustainability gains. How users travel to site can also influence health and social gains. Reducing reliance on private cars can also reduce localised congestion which supports local air quality; reduces traffic noise; promotes healthy lifestyles and supports connectivity to the wider area. Accessibility can also significantly influence user perception of development quality.

6.01 - To what extent will the masterplan prioritise pedestrians and encourage pedestrian movement?

A development that is attractive to pedestrians will enhance the user experience and help create a positive image for Smithfield. By emphasising the quality of the pedestrian and street environment.

Compliant / Standard Practice

Pedestrian routes allow easy navigation around the development using key features and existing neighbourhoods to aid navigation. As a minimum, the following is achieved:

- new routes into the development are a continuation of existing routes from the surrounding area;
- routes connect residential areas to, and between, community focal points in the development and surrounding area.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Best Practice

The masterplan provides a high quality pedestrian environment which is well designed, safe and secure.

The pedestrian network connects the development with the surrounding area and encourages pedestrian movement within the local area.

Relevant Policy / Guidance

- Birmingham Connected

Aspirational

The masterplan prioritises pedestrians and provides a network of positive connections with the surrounding area and public transport nodes.

A pedestrian-focussed environment will be created through appropriate design measures such as pedestrian priority routes, shared surfaces, and public space.

Relevant Policy / Guidance

- Birmingham Connected

Who is accountable for delivering this?

- Sylvia Broadley
- Anne Shaw
- Phil Edwards

Link to SDG's

3. Ensure healthy lives and promote well-being for all at all ages

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? Notionally designing a high quality pedestrian environment that takes account of safety and security should not attract additional capital cost. Where there are specific risks identified there may be additional cost in overcoming them through safety features but this should be seen as an essential cost and part of project delivery. Connection beyond the site may be an additional cost where extensive landscaping and works are required to create connections.
What are the cost implications of moving beyond compliance? Designing environments where pedestrians have priority has the potential to reduce costs associated with barriers to protect pedestrians and other safety features. A more complex system of materials may be required.
What is the value of moving beyond compliance? Creating a safe and walkable street network will support positive perceptions associated with the site as being safe and welcoming in a pedestrian focussed environment, although this obviously needs to be balanced with the transport strategy and vehicle movements. This also has the potential to increase footfall and support the viability of retail units on the site. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to prioritise pedestrians and encourage pedestrian will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

6.02 - To what extent will the masterplan encourage cycling as a means of transport?

Encouraging cycling promotes a number of sustainability goals, providing low carbon transport, promoting health and wellbeing, reducing traffic congestion and improving air quality. Connecting the development to nearby cycle routes.

Compliant / Standard Practice

The development is designed to be accessible by bicycle with a cycle network within the development that encourages cycling.

Relevant Policy / Guidance

- Birmingham Connected
- Birmingham Cycle Revolution

Best Practice

The following is met:

- Cycle routes in the development connect to, or are a continuation of existing routes from the surrounding area.
- Cycle routes connect residential areas to, and between, community focal points in the development and surrounding area.
- Cycle routes are direct and safe (well lit, safe road crossings etc.).
- Cycle routes are segregated from vehicles and pedestrians as appropriate:
    - on low speed streets (below20mph) cyclists can be integrated with vehicles;
    - on busy streets or where there are higher traffic speeds there should be clearly defined cycle lanes;
    - separate cycle tracks should be introduced where space allows, in particular where the traffic speeds exceed 30mph;
    - pedestrians and cyclists can share the same space, but steps must be taken to segregate the two, for example, a raised kerb or clear markings. Where pedestrians and cyclists share the same space but segregation is not possible, a minimum width of 3 metres should be provided.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

• Adequate signage detailing directions and route information is provided to aid cyclist navigation around the development and into the surrounding area.	
Aspirational Best Practice is met PLUS: • Special provision is provided at junctions (including roundabouts) for cyclists. Junctions are designed to ensure that cyclists can see, and be seen by other road users. Cyclists are given priority at interchanges with other infrastructure networks, for example, through the phasing of lights, priority crossing points and advanced stop lines. • Cycle routes are attractive and designed to be enjoyable in order to encourage cycling and discourage the use of vehicles.	**Relevant Policy / Guidance** • http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf
Who is accountable for delivering this? • Sylvia Broadley • Phil Edwards • Kyle Stott	
Link to SDG's **3 Ensure healthy lives and promote well-being for all at all ages** **3.6** By 2020, halve the number of global deaths and injuries from road traffic accidents **11 Make cities and human settlements inclusive, safe, resilient and sustainable** **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	

Whole Life Value Assessment

What are the cost implications of compliance? Including cycling infrastructure may require additional capital cost dependent on the design solution taken. Where cycling infrastructure is segregated there will be additional cost. Where this is integrated into the street network it should be incorporated within the cost of infrastructure works. Some additional signage and way finding may be required.

What are the cost implications of moving beyond compliance? Connecting the site to local roads is essential for access. Identifying existing cycle routes and providing safe access to these will be part of the standard capital works.

What is the value of moving beyond compliance? Cycling is growing in popularity as a cheap, low carbon and healthy mode of transport. Supporting this within the development will support perceptions of the site as being accessible. This has the potential to increase 'foot fall' from cyclists using the site as a route to access the potential cycle superhighway which may support businesses located on site. Increasing cycling also has the potential to reduce the burden on other transport infrastructure. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to encourage cycling will be predominantly social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.03 - Will the masterplan incorporate cycle parking and facilities that encourage cycling?

Provision of cycling facilities supports cyclists and promotes cycling as a transport choice for development users. Supporting infrastructure extends beyond cycle parking to incorporate showers, lockers and changing rooms for cyclists.

Compliant / Standard Practice

Provision of a suitable number of cycle parking docks which meet the local Cycling Design Standards and address the needs of both short and long stay users.

Relevant Policy / Guidance

- Birmingham Connected
- Birmingham Cycle Revolution
- Birmingham Parking Strategy

Best Practice

Compliant / Standard Practice PLUS:

An adequate number of facilities are provided to support cycling; this includes changing rooms, showers and lockers.

Relevant Policy / Guidance

- Birmingham Connected
- Birmingham Cycle Revolution
- Birmingham Development Plan

Aspirational

Smithfield serves as a catalyst for the Birmingham Bike Share scheme. This includes a review as to the viability for the development to support the start of a Birmingham wide Bike Share scheme.

Relevant Policy / Guidance

- Birmingham Development Plan (TP40)

Who is accountable for delivering this?

- Sylvia Broadley
- Phil Edwards

Link to SDG's

3.Ensure healthy lives and promote well-being for all at all ages

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? The cost of providing safe and secure cycle parking represents a slight capital cost increase for the provision but this should be seen as essential. There may be an additional cost in the provision of this to meet specific design / space standards over more standard amenities.
What are the cost implications of moving beyond compliance? Providing additional facilities beyond cycle parking will incur an additional capital cost. These facilities will also incur additional maintenance costs.
What is the value of moving beyond compliance? Cycling is growing in popularity and providing suitable infrastructure to support cyclists will add to positive perceptions of development users. This includes students and staff working at the site. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for cycle parking and facilities will be predominantly social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.04 - Will the masterplan promote access to public transport?

Making public transport accessible through the design of the development can promote public transport use, encouraging people to make more sustainable transport choices whilst enhancing the user experience and identity of Smithfield.

Compliant / Standard Practice

The masterplan establishes pedestrian connections with key public transport nodes in proximity to the development.

Relevant Policy / Guidance

- Birmingham Connected

Best Practice

Compliant / Standard Practice PLUS:

The masterplan promotes access to public transport nodes.

This includes pedestrian routes that follow desire lines and connect with the surrounding area. The opportunity for a new urban plaza to promote key public transport nodes (e.g. Birmingham New Street station) is considered in the masterplan.

Relevant Policy / Guidance

- Birmingham Connected

Aspirational

To ensure the availability of frequent and convenient public transport links to fixed public transport nodes (train, bus, tram or tube) and local centres.

The distance from each building entrance to a compliant transport node must be via a safe and convenient pedestrian route and between the following distances:

- All nodes should be <350m.

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Who is accountable for delivering this?

- Sylvia Broadley
- Anne Shaw

Link to SDG's

3 Ensure healthy lives and promote well-being for all at all ages

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? The provision of safe connecting routes to local transport nodes will support access to the site for all users. There may be an additional capital cost in providing this but this should be considered essential infrastructure. Work beyond the site boundary may be required to ensure these access routes are safe and secure and this may represent an additional cost.
What are the cost implications of moving beyond compliance? Moving beyond compliance requires that the design and layout of the site supports access and views into and out of the site connecting to existing transport infrastructure. Dependent on the extent of this there may be an additional capital cost. There may be conflicts with other transport types that need to be overcome to support safe access. This includes rights of way and any existing road junctions / pedestrian crossings etc. This may require collaboration with transport providers.
What is the value of moving beyond compliance? Ease of access to the site from surrounding key transport nodes will contribute to positive perceptions and the amenity value attached to the site as a 'destination'. This will support staff and students and ensure the operational efficiency of the development. This has the potential to reduce costs of delays in people reaching site which is difficult to quantify. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for access to public transport will be predominantly social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.05 - Does the masterplan incorporate infrastructure to support electric, or alternative fuel, vehicles?

Infrastructure to support electric vehicles can encourage the transition to low carbon transport and improve air quality in Birmingham. It is anticipated that the use of electric vehicles will increase, providing an opportunity for Smithfield to provide infrastructure that meets future needs and promotes more sustainable choices. The opportunity to incorporate this infrastructure is greatest at design stage.

Compliant / Standard Practice

- The parking strategy includes a strategy to ensure that ensure that 1 in 5 spaces (both active and passive) provide an electrical charging point to encourage the uptake of electric vehicles OR that the parking policy confirms with the West Midlands Low Emissions Towns and Cities Programme.

Relevant Policy / Guidance

- Policy TP42 Low emission vehicles
- Birmingham Connected
- Birmingham Development Plan
- Birmingham Parking Strategy

Best Practice

For Residential Buildings:

- 1 charging point per unit (house with dedicated parking)
- 1 charging space per 10 spaces (unallocated parking)

For Commercial Buildings:

- 10% of parking spaces

For Industrial Buildings:

- 10% of parking spaces

Relevant Policy / Guidance

- West Midlands Low Emissions Towns and Cities Programme

Aspirational

The Parking and energy strategy takes account of electric vehicle to grid charging and explores the feasibility of this at Smithfield.

Relevant Policy / Guidance

- Aston University electric vehicle to grid research: http://www.aston.ac.uk/news/releases/2016/february/aston-commissions-uks-first-electric-vehicle-to-grid-charging-system/

Who is accountable for delivering this?

- Sylvia Broadley

Link to SDG's

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? Electric vehicles are increasing in popularity. Providing electric vehicle charging points at key locations is supporting their uptake.
What are the cost implications of moving beyond compliance? To go beyond the minimum required number of electric vehicle charging points would represent an additional capital cost. This is very small within the context of the masterplan.
What is the value of moving beyond compliance? Electric vehicles are increasingly popular. This growth in popularity is seeing an increase in the provision of electric vehicle charging points to support electric vehicle users. This will support users of the site and is a very public sustainable credential.
It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for infrastructure for electric vehicles could be a mixture of economic, social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.06 - Will the masterplan deliver an accessible and inclusive environment?

Inclusive Design takes account of disability, age, gender, ethnicity and economic circumstances to promote access for all users. Promoting access at a building level can support positive user perception of the building. Extending this to the site level will ensure that Smithfield is an inclusive environment for all development users.

Compliant / Standard Practice

The masterplan achieves a high standard of accessible and inclusive design.

The masterplan seeks to ensure that the completed development:

- Can be used safely, easily and with dignity by all regardless of disability, age, gender, ethnicity or economic circumstances;
- Is convenient and welcoming with no disabling barriers, so everyone can use it independently without undue effort, separation or special treatment;
- Is flexible and responsive taking account of what different people say they need and want, so people can use it in different ways.

Relevant Policy / Guidance

- Birmingham Access Forum
- Equality Act 2010

Best Practice

Compliant / Standard Practice PLUS:

There is a commitment to engage with relevant user groups to better understand the specific needs of older and disabled people in order to respond to these needs through the design of the development.

Relevant Policy / Guidance

- Birmingham Access Forum
- Equality Act 2010

Aspirational

- An appropriately qualified independent access consultant is commissioned to provide advice on the both strategic and detailed design proposals.
- Deliberations and decisions taken within the project team are tracked by the project manager based on documentation and preliminary advice obtained from the access consultant. The views of

Relevant Policy / Guidance

- http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

organisational duty holders (such as the champion for inclusive design and management) and of third-party stakeholders are also accounted, recorded and considered. • There is evidence within the decisions taken that design implications are anticipated and that plans are made to develop operational management strategies. These decisions are recorded and communicated to inform those who will use and manage the environment.	

Who is accountable for delivering this?

- Sylvia Broadley
- Simon Dellahunty-Forrest

Link to SDG's:

1. Make cities and human settlements inclusive, safe, resilient and sustainable

1.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums

Whole Life Value Assessment

What are the cost implications of compliance? Providing a site that is accessible by all is an essential part of compliance with Building Regulations Part M. As such this does not represent an additional capital cost.
What are the cost implications of moving beyond compliance? Engaging specific disability groups may incur additional professional fees in design and time from development representatives. Where design iterations are required or alterations / corrective works to the site once it is designed / constructed then this may incur additional cost.
What is the value of moving beyond compliance? The value of providing access for all will be realised in those development uses that are supported through the design solutions adopted. This will support their safe access to the site and access to education. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for an accessible and inclusive environment will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

6.07 - What measures will be taken to reduce reliance on private cars?

One of the key design principles of Smithfield, due to its urban connectivity, should be to reduce the reliance of future residents on private cars. This should be achieved through the provision of public transport infrastructure and encouraging journeys via means other than private car.

Compliant / Standard Practice

Travel plans for the development set out the appropriate alternative transport options, on the basis of: occupancy of the development potential reduction in greenhouse gas emissions from different solutions costs involved in different solutions existing alternative transport facilities within the community possibility of external funding potential for community management of solutions.

The transport assessment / statement and travel plans positively influence the environmental sustainability of the development and wellbeing of future residents. This is achieved through recommendations or plans to:

- reduce the need for travel (especially by car);
- reduce the length of trips;
- promote multi-purpose or linked trips;
- promote a more sustainable pattern of development e. reduce the physical separation of key land uses;
- reduce distances from buildings to public transport nodes;
- improve sustainable transport choices through actions such as increased or improved walking/cycling and public transport infrastructure and facilities;
- Ensure safe and easy access to jobs, shopping, leisure facilities and services by walking, cycling and public transport.

Relevant Policy / Guidance

- West Midlands Low Emissions Towns and Cities Programme

Best Practice

At least one alternative means of sustainable transport has been established / incorporated into the community.

The sustainable transport options are advertised in order to ensure all members of the community are aware of the options available.

Relevant Policy / Guidance

- West Midlands Low Emissions Towns and Cities Programme

Management plans are in place to monitor use and ensure facilities are well maintained. These may include, but are not limited to: • car pools / clubs; • cycle hire schemes; • lift sharing clubs; • community electric vehicle hire; • Community work / office space – to avoid the need to commute to offices.	
Aspirational Parking is integrated into the development without allowing it to dominate the space or interfere with cyclist, pedestrian and motor vehicle movement. Where appropriate, residential parking is located behind, under, above or to the side of the building as opposed to within the front curtilage. Residential parking is overlooked by houses and is located an appropriate distance from the vehicle owner's dwelling, as established during consultation. Where relevant, secure underground parking is provided with the incorporation of SMART technologies.	**Relevant Policy / Guidance** • Birmingham Connected
Who is accountable for delivering this? • Sylvia Broadley • Anne Shaw	
Link to SDG's: **11. Make cities and human settlements inclusive, safe, resilient and sustainable** **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons **11.6** By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	

Whole Life Value Assessment

What are the cost implications of compliance? The implementation of transport assessments and recommendations should sit within the travel plans for Birmingham Smithfield. There should be minimal additional capital costs as this fits with the City's agenda to provide safe, affordable, accessible and sustainable transport systems.
What are the cost implications of moving beyond compliance? Additional sustainable transport measures may incur further costs due to the associated set up costs of implementing an alternative sustainable transport system. The suggested alternatives, whilst carrying additional capital and operating costs, will take pressure of existing services and reduce congestion in the city areas.
What is the value of moving beyond compliance? With the integration of parking into the development, minimising the amount of space required and reducing the interference with other transports means will incur capital costs. Good design and location will reduce the costs, but the integration of SMART technologies such as parking space security, free space indicators and vehicle stacking systems are all good examples of solutions that will incur costs. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for reducing reliance on private car will be social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.08 - What measures will be taken to reduce congestion within and around the boundaries of the development?

Due to the sites location and urban density it is important to reduce its impact on the centre of Birmingham by supporting a reduction in road traffic.

Compliant / Standard Practice

The design of the development takes account of the intermodality / transport choices of residents to support the use of public transport. This includes an allowance in the masterplan to take account of New Street / Curzon Street (HS2) and the metro system.

Relevant Policy / Guidance

- Birmingham Connected

Best Practice

Cycling will be encouraged through a comprehensive city-wide programme of cycling infrastructure improvements (both routes and trip end facilities) supported by a programme of cycling promotion, accessible cycling opportunities, training and travel behavioural change initiatives. This will include:

• Development of different route types e.g. improvements to major radial roads and other main roads including improved crossing facilities and creating new, quieter, parallel routes, using roads with lower speed limits and traffic flows, linking residential areas, green spaces, local centres and transport interchanges in order to encourage short trips and offer an alternative to busy A and B roads.

• Further development and enhancement of an extensive off-road network of canal towpaths and green routes.

• Incorporating cycling into the 'Interconnect' on-street wayfinding Totems currently being rolled out across the City Centre, and using improved direction signing.

• Improving cycle security with upgraded parking and trip end facilities within the City Centre and local centres.

• Increasing access to bicycles with cycle loan and hire opportunities.

• Providing enabling support to take up cycling through training and travel behaviour initiatives.

Relevant Policy / Guidance

- Promoting sustainable transport systems including cycling and walking
- (Policies TP37-TP40).

Aspirational	Relevant Policy / Guidance
Not Set.	• Promoting sustainable transport systems including cycling and walking • (Policies TP37-TP40).

Who is accountable for delivering this?

- Sylvia Broadley
- Anne Shaw

Link to SDG's:

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

Whole Life Value Assessment

What are the cost implications of compliance? With good planning and design management, with focus on the public transport choices made by residents, there should be minimal impact to capital costs. The main consideration will be to ensure that there is a good level of integration with the existing infrastructure network that feeds Birmingham City.
What are the cost implications of moving beyond compliance? The initial capital costs of implementing a fully connected cycling network will be hugely beneficial in the long term. The use of a sustainable transport system will take pressure off alternative routes. There will be costs associated with annual surveys and reports to ascertain the effectiveness of the systems, in order to make sure that the percentage targets for travel by foot or cycle are met.
What is the value of moving beyond compliance? Moving beyond compliance will ensure that a sustainable travel network will be integrated into the City's infrastructure. This will take the pressure off the existing public transport networks and promote a healthier, cleaner mode of travel for residents. A collaborative approach across the city will reduce the congestion, helping to minimise the impacts of air pollution. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for reducing reliance on private car will be economic, social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

6.09 - To encourage more frequent use of public transport during the entire year, by having waiting areas which are considered safe and out of the weather.	
Changing habits is essential to supporting low carbon transport choices. Providing safe, comfortable waiting facilities can support people's choices to utilise public transport.	
Compliant / Standard Practice Consultation has taken place between the local authority, developer, community representatives and public transport providers to establish the likely facility requirements. As a minimum, the consultation considers the following: occupants and potential visitors and their accessibility needs. Expected number of users at each public transport stop existing facilities provision of facilities and amenities. The results of the consultation have been analysed and appropriate facilities are planned and designed that encourage the use of public transport. Shelters will be provided at public transport stops, especially those close to key community focal points within the development. Shelters will be of adequate size to accommodate potential users of varying ages and disabilities.	**Relevant Policy / Guidance** • Birmingham Connected
Best Practice Shelters within the development will be compliant with: • Shelters will be designed and sited to provide protection from weather conditions taking into consideration prevailing wind direction, splashes from passing vehicles and protection from the sun. • Shelters will provide a safe and comfortable waiting area for users, in particular shelters will be well lit and allow sufficient ventilation to avoid overheating. • Shelters will be visible to the surrounding environment and community. • Shelters will not obstruct other area users such as pedestrians and cyclists and allow sufficient room for wheelchair users and those with prams / buggies to pass with ease	**Relevant Policy / Guidance** • Birmingham Connected

• Shelters will have up-to-date timetabling information prominently on display in the shelter.
• Shelters will provide sufficient seating for the users of the development for all ages and disabilities, as judged through the consultation with service providers and the local authority.
• Street furniture will not be positioned where boarding / alighting is expected. Street furniture (apart from seating) should not be situated within the waiting area. Street furniture will:
  ○ be aligned to capital programmes and replace costs build in for providing seating
  ○ Reduce maintenance costs of existing benches
• Secure cycle parking structures are provided near the public transport shelters/facilities to allow for transfer between modes of transport. The number of cycle spaces accommodated should be determined by the likely users identified in the transport assessment.
• Recycling facilities are provided within the public realm to minimise waste sent to landfill.	

Aspirational **Compliant / Best Practice PLUS:** • Litter bins will be provided by each shelter, positioned to avoid any interference with the use of the shelter. Regular refuse collection is negotiated with the local authority. • Shelters will have real-time timetable information feeds • Where the consultation identifies a significant risk of vandalism, CCTV that covers the shelter and surrounding area should be installed and the shelter should be constructed of vandal resistant materials • A renewable energy supply (with a storage capacity to work after dark) will be used to power the shelters lighting and real-time timetabling displays.	**Relevant Policy / Guidance** • Birmingham Connected

Who is accountable for delivering this?

- Sylvia Broadley
- Anne Shaw

Link to SDG's:

11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? The provision of effective and safe waiting areas will be relatively low cost as standard shelters are of adequate size to accommodate potential users of varying ages and disabilities. These urban bus stops would include a standard shelter to meet compliance.
What are the cost implications of moving beyond compliance? The provision of larger semi enclosed spaces, with a greater specification will incur further costs but with a greater opportunity to create longer term value.
What is the value of moving beyond compliance? The value of providing secure shelters for public transport will be realised in those development areas that are supported through the design solutions adopted. This will support their safe access to public transport and will ensure a better system for all residents. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for an accessible and inclusive environment will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

6.10 - Does the masterplan encourage the use of logistics providers with a demonstrably good sustainability record?	
Good logistics providers can demonstrate that they are able to measure and report their environmental and social impact, can operate efficiently (through consolidation, technology, use of a globally integrated network, etc.), have a commitment to the deployment of alternative technologies, are members of relevant industry programmes (e.g. FTA's Logistics Carbon Reduction Scheme) and have gained independent external recognition for these steps. The City can engage in this by taking the following action to support the delivery of The City Clean Air Zone:	
Compliant / Standard Practice Encourage and publicise externally and internally.	**Relevant Policy / Guidance** • Policy TP41 Freight
Best Practice As above plus require use internally for City's own logistics needs.	**Relevant Policy / Guidance** • Policy TP41 Freight
Aspirational A well-integrated freight distribution system which makes the most efficient and effective use of road, rail, air and water transport will be sought. Locations to support freight logistics will be required to demonstrate that: • Developments which generate large volumes of freight traffic or involve the transport of bulk materials should make use of rail (or water if appropriate) for freight movements wherever practical. They should include as part of the development, or be located close to, inter-modal freight facilities, rail freight facilities or wharves. • Sites which are used or are suitable for inter-modal transfer facilities, rail freight facilities, including rail aggregate facilities and water-borne freight facilities will normally be protected for these uses. • The retention of rail freight connections to existing industrial sites will be encouraged and the development of new inter-modal transfer facilities, new rail sidings and rail freight facilities and new wharves will be supported. • Consideration will be given to providing long stay lorry parking in areas where there are significant logistical movements. Where road haulage is involved in the transport of large volumes	**Relevant Policy / Guidance** • Policy TP41 Freight

of freight or the carrying of bulk materials, planning conditions and obligations will be used to define and agree suitable traffic routes and the need for other necessary environmental and traffic management controls.	

Who is accountable for delivering this?

- Sylvia Broadley
- Andy Radford

Link to SDG's:

11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Whole Life Value Assessment

What are the cost implications of compliance? The provision of good logistics providers whose sustainability credentials are clear will not have an impact on the costs of the project. It should highlight a consistent approach to logistics utilised within the development that reinforces it as a destination within the centre of Birmingham. It will help embed good sustainability practice across the project.
What are the cost implications of moving beyond compliance? Moving beyond compliance will mean a fully integrated and connected plan to ensure that the most efficient use of road, rail, air and water transport methods are used in the most effective way across the City. There will need to be detailed transport and logistic assessments undertaken to ensure a joined up approach.
What is the value of moving beyond compliance? By being able to measure and report on environmental and social impacts, the value to the project will be to ensure a joined up, safe, affordable, accessible and sustainable transport system that works for all residents. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for an accessible and inclusive environment will be predominantly economic and social.

Whole Life Value		
Economic		
Social		
Environmental		

6.11 - What measures will be taken beyond those in 6.10 to reduce the contribution of goods deliveries to carbon and air quality emissions?	
The city can actively support electric and other alternative fuel vehicles that will reduce emissions, such as electric, range extended electric and biomethane from organic waste, by taking the following action:	
Compliant / Standard Practice None or Euro 4 (Relevant Policy / Guidance – Euro standard regulations).	**Relevant Policy / Guidance** • Euro standard regulations, London ULEZ • West Midlands Low Emissions Towns and Cities Programme • Policy TP42 Low emission vehicles
Best Practice Euro 6 by 2020.	**Relevant Policy / Guidance** • Euro standard regulations, London ULEZ • West Midlands Low Emissions Towns and Cities Programme • Policy TP42 Low emission vehicles
Aspirational Zero or ultra-low emission vehicles only by 2020 / 25, with active provision of charging points and gas filling stations plus active incentives for purchase such as help with depot based charging infrastructure upgrades.	**Relevant Policy / Guidance** • Euro standard regulations, London ULEZ • Office of Low Emission Vehicles: www.gov.uk/government/organisations/office-for-low-emission-vehicles • West Midlands Low Emissions Towns and Cities Programme • Policy TP42 Low emission vehicles
Who is accountable for delivering this? • Sylvia Broadley • Mark Wolstencroft	
Link to SDG's: **11. Make cities and human settlements inclusive, safe, resilient and sustainable** **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	

Whole Life Value Assessment

What are the cost implications of compliance? The costs implications for reducing the levels of delivery trucks and goods will be minimal. The process will be largely down to the rules set out in the West Midlands Low Emissions Towns and Cities Programme. The costs will be incurred by the developers to ensure delivery requirements are efficient and comply with the local rules. Depending on the punitive action that may occur for non compliance, costs will vary.
What are the cost implications of moving beyond compliance? Moving beyond compliance will affect the costs, depending on the level of participation by the providers and whether a joined up approach will generate efficiencies.
What is the value of moving beyond compliance? By being able to minimise the level of deliveries and trucks there will be widespread benefits to the wider environment and society. The value to the project will be to ensure a joined up, safe, affordable, accessible and sustainable transport system that works for all residents as congestion is eased. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for an accessible and inclusive environment will be predominantly economic and social.

Whole Life Value		
Economic		
Social		
Environmental		

6.12 - What measures will be taken beyond those in 6.10 to reduce the contribution of goods deliveries to congestion?	
The city can actively encourage methods of goods movement that does not involve the use of trucks, e.g. use of walkers, tricycles and electrically assisted tricycles, by taking the following action:	
Compliant / Standard Practice Encourage use.	**Relevant Policy / Guidance** • West Midlands Low Emissions Towns and Cities Programme
Best Practice Develop active partnerships with providers that demonstrate they are willing and able to pursue this as a strategy.	**Relevant Policy / Guidance** • (Relevant Policy / Guidance – Example: UPS in Hamburg). • West Midlands Low Emissions Towns and Cities Programme
Aspirational Not Set.	**Relevant Policy / Guidance** • West Midlands Low Emissions Towns and Cities Programme
Who is accountable for delivering this? • Phil Edwards	
Link to SDG's: **11. Make cities and human settlements inclusive, safe, resilient and sustainable** **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	

Whole Life Value Assessment

What are the cost implications of compliance? The costs implications for reducing the levels of delivery trucks and goods will be minimal. The process will be largely down to the rules set out in the West Midlands Low Emissions Towns and Cities Programme. The costs will be incurred by the developers to ensure delivery requirements are efficient and comply with the local rules. Depending on the punitive action that may occur for non compliance, costs will vary.
What are the cost implications of moving beyond compliance? Moving beyond compliance will affect the costs, depending on the level of participation by the providers and whether a joined up approach will generate efficiencies.
What is the value of moving beyond compliance? By being able to minimise the level of deliveries and trucks there will be widespread benefits to the wider environment and society. The value to the project will be to ensure a joined up, safe, affordable, accessible and sustainable transport system that works for all residents as congestion is eased. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for an accessible and inclusive environment will be predominantly economic and social.

Whole Life Value		
Economic		
Social		
Environmental		

6.2 Transport Cost Benefit Analysis

This section attempts to provide a high-level review of potential costs associated with the transport implementation programme that could be deployed as part of the Birmingham Smithfield redevelopment to support its ambition of being carbon neutral.

As the development is still at the master plan stage a range of assumptions have been made on the building sizes and designs. The analysis looks at each key question and provides indicative costs for each level of achievement

The cost benefit analysis does not look at how the various technologies can be combined to provide the overall scheme design and each one is taken in isolation. This section provides information about the different models and reports that will provide a transport solution, but does not provide analysis of a design for the scheme. Information is provided on each component based on a sizing that is relative to the scheme.

It is recommended that once more detail on the developments design and specification are known a more detailed assessment is undertaken to determine how the various reports and assessments could be implemented.

6.01	To what extent will the masterplan prioritise pedestrians and encourage pedestrian movement?							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	Pedestrian routes allow easy navigation around the development using key features and existing neighbourhoods to aid navigation. As a minimum, the following is achieved: new routes into the development are a continuation of existing routes from the surrounding area; routes connect residential areas to, and between, community focal points in the development and surrounding area.	design & construction				£0 cost as base provision		
Best Practice	The masterplan provides a high quality pedestrian environment which is well designed, safe and secure. The pedestrian network connects the development with the surrounding area and encourages pedestrian movement within the local area.	design & construction				£115/m2		definition of quality - this could relate to width of routes, spec of finishes, amount of lighting, location of routes - granite kerbs, paved surfaces, enhanced lighting, soft landscaping
Aspirational	The masterplan prioritises pedestrians and provides a network of positive connections with the surrounding area and public transport nodes. A pedestrian-focussed environment will be created through appropriate design measures such as pedestrian priority routes, shared surfaces, and public space.	design & construction				£200/m2		assume that roads are secondary to pedestrians with significant traffic calming measures/shared surfaces or if major roads will be required to be in tunnels/bridges - cost does not reflect potential additional cost of land to provide planned area
6.02	**To what extent will the masterplan encourage cycling as a means of transport?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The development is designed to be accessible by bicycle with a cycle network within the development that encourages cycling.	design & construction				£50/m2		provision of standard cycle route - assumed addition to new roads/adjacent to new paths (cost in enhanced width & markings only)
Best Practice	The following is met: Cycle routes in the development connect to, or are a continuation of existing routes from the surrounding area. Cycle routes connect residential areas to, and between, community focal points in the development and surrounding area. Cycle routes are direct and safe (well lit, safe road crossings etc.).	design & construction				£75/m2		provision of 3m cycle path - segregated

	Cycle routes are segregated from vehicles and pedestrians as appropriate: on low speed streets (below20mph) cyclists can be integrated with vehicles; on busy streets or where there are higher traffic speeds there should be clearly defined cycle lanes; separate cycle tracks should be introduced where space allows, in particular where the traffic speeds exceed 30mph; pedestrians and cyclists can share the same space, but steps must be taken to segregate the two, for example, a raised kerb or clear markings. Where pedestrians and cyclists share the same space but segregation is not possible, a minimum width of 3 metres should be provided. Adequate signage detailing directions and route information is provided to aid cyclist navigation around the development and into the surrounding area.							
Aspirational	Best Practice is met PLUS: Special provision is provided at junctions (including roundabouts) for cyclists. Junctions are designed to ensure that cyclists can see, and be seen by other road users. Cyclists are given priority at interchanges with other infrastructure networks, for example, through the phasing of lights, priority crossing points and advanced stop lines. Cycle routes are attractive and designed to be enjoyable in order to encourage cycling and discourage the use of vehicles.	design & construction				£40,000/junction		enhancement provision at junctions
6.03	**Will the masterplan incorporate cycle parking and facilities that encourage cycling?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	Provision of a suitable number of cycle parking docks which meet the local Cycling Design Standards and address the needs of both short and long stay users.	design & construction				£750/cycle hoop (£3,000 if covered)		?? If required to be covered

Best Practice	Compliant / Standard Practice PLUS: An adequate number of facilities are provided to support cycling; this includes changing rooms, showers and lockers.	design & construction						This will be provided in BREEAM Excellent buildings, but not for private use
Aspirational	The development supports a Birmingham wide Bike Share scheme. Smithfield serves as a catalyst for the Birmingham Bike Share scheme.	design & construction				£25,000/bike		Boris bikes cost - including docking stations - excludes cost of running the scheme, deductions for sponsorship, allowance for income
6.04	**Will the masterplan promote access to public transport?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The masterplan establishes pedestrian connections with key public transport nodes in proximity to the development.					£0 cost		assumes no new transport 'stations' created - use of bus stops, etc
Best Practice	Compliant / Standard Practice PLUS: The masterplan promotes access to public transport nodes. This includes pedestrian routes that follow desire lines and connect with the surrounding area. The opportunity for a new urban plaza to promote key public transport nodes (e.g. Birmingham New Street station) is considered in the masterplan.					£/promotion		Promotion cost - advertising
Aspirational	To ensure the availability of frequent and convenient public transport links to fixed public transport nodes (train, bus, tram or tube) and local centres. The distance from each building entrance to a compliant transport node must be via a safe and convenient pedestrian route and between the following distances: All nodes should be <350m.							?? Could be significant cost dependant on distance - cost of new bus/tram/train hubs ? Definition of node
6.05	**Does the masterplan incorporate infrastructure to support electric, or alternative fuel, vehicles?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The parking strategy includes XX% of spaces with integrated electric vehicle charging.					£5000/space		potential to be subsidised by vehicle manufactureres/grants
Best Practice	The Parking and energy strategy takes account of electric vehicle to grid charging and explores the feasibility of this at Smithfield.					£50 - 100k /space		currently not available in UK - ?? the efficiency the willingness of people to cycle their car batteries in

								unusual ways that may run down the battery faster and require earlier replacement
Aspirational								
6.06	**Will the masterplan deliver an accessible and inclusive environment?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The masterplan achieves a high standard of accessible and inclusive design. The masterplan seeks to ensure that the completed development: Can be used safely, easily and with dignity by all regardless of disability, age, gender, ethnicity or economic circumstances; Is convenient and welcoming with no disabling barriers, so everyone can use it independently without undue effort, separation or special treatment; Is flexible and responsive taking account of what different people say they need and want, so people can use it in different ways.					£0		Assumes achieved through good practice urban design
Best Practice	Compliant / Standard Practice PLUS: There is a commitment to engage with relevant user groups to better understand the specific needs of older and disabled people in order to respond to these needs through the design of the development					£100,000	£100,000	Cost of engagement - appointment of consultant, public consultation
Aspirational	Aspirational An appropriately qualified independent access consultant is commissioned to provide advice on the both strategic and detailed design proposals. Deliberations and decisions taken within the project team are tracked by the project manager based on documentation and preliminary advice obtained from the access consultant. The views of organisational duty holders (such as the champion for inclusive design and management) and of third-party stakeholders are also accounted, recorded and considered. There is evidence within the decisions taken that design implications are anticipated and that plans are made to develop operational management strategies.					£200,000	£200,000	Cost of engagement - appointment of consultant, public consultation - scale of consultation increased

	These decisions are recorded and communicated to inform those who will use and manage the environment.							
6.07	**What measures will be taken to reduce reliance on private cars?**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	Travel plans for the development set out the appropriate alternative transport options, on the basis of: occupancy of the development potential reduction in greenhouse gas emissions from different solutions costs involved in different solutions existing alternative transport facilities within the community possibility of external funding potential for community management of solutions. The transport assessment / statement and travel plans positively influence the environmental sustainability of the development and wellbeing of future residents. This is achieved through recommendations or plans to: reduce the need for travel (especially by car); reduce the length of trips; promote multi-purpose or linked trips; promote a more sustainable pattern of development e. reduce the physical separation of key land uses; reduce distances from buildings to public transport nodes; improve sustainable transport choices through actions such as increased or improved walking/cycling and public transport infrastructure and facilities; ensure safe and easy access to jobs, shopping, leisure facilities and services by walking, cycling and public transport.	assessment & report				£??? /assessment		Transport assessment & recommendation
Best Practice	Best Practice At least one alternative means of sustainable transport has been established / incorporated into the community. The sustainable transport options are advertised in order to ensure all members of the community are aware of the options available. Management plans are in place to monitor use and ensure facilities are well maintained. These may include, but are not limited to:	design, promotion & construction				??		?? Does this include the set up costs/technology

	car pools / clubs; cycle hire schemes; lift sharing clubs; community electric vehicle hire; community work / office space – to avoid the need to commute to offices.							
Aspirational	Aspirational Parking is integrated into the development without allowing it to dominate the space or interfere with cyclist, pedestrian and motor vehicle movement. Where appropriate, residential parking is located behind, under, above or to the side of the building as opposed to within the front curtilage. Residential parking is overlooked by houses and is located an appropriate distance from the vehicle owner's dwelling, as established during consultation. Where relevant, secure underground parking is provided with the incorporation of SMART technologies.	design & construction				£0/space for good design & location - £10k - 50k/space for underground smart technologies		definition of SMART technology - could be space security, free space indicators, car stacking systems
6.08	**What measures will be taken to reduce congestion within and around the boundaries of the development? Due to the sites location and urban density it is important to reduce its impact on the centre of Birmingham by supporting a reduction in road traffic.**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	The design of the development takes account of the intermodality / transport choices of residents to support the use of public transport. This includes an allowance in the masterplan to take account of New Street / Curzon Street (HS2) and the metro system.							
Best Practice	A target % is set for journey completion for Smithfield residents by bike or by foot is set. This is reported annually via a sustainable lifestyle update for BCC.					£30,000/year annual survey & report		
Aspirational								
6.09	**To encourage more frequent use of public transport during the entire year, by having waiting areas which are considered safe and out of the weather.**							
	Key Questions	**Technology**	**Benefits**	**Issues**	**Scheme Potential**	**Cost / Unit**	**Scheme cost**	**Commercial Models / Economics**
Compliant / Standard Practice	Consultation has taken place between the local authority, developer, community representatives and public transport providers to establish the likely facility requirements. As a minimum, the consultation					£0		Assumed that urban bus stops would include for a standard shelter

	considers the following: occupants and potential visitors and their accessibility needs. Expected number of users at each public transport stop existing facilities provision of facilities and amenities. The results of the consultation have been analysed and appropriate facilities are planned and designed that encourage the use of public transport. Shelters will be provided at public transport stops, especially those close to key community focal points within the development. Shelters will be of adequate size to accommodate potential users of varying ages and disabilities.							
Best Practice	Best Practice Shelters within the development will be compliant with: Shelters will be designed and sited to provide protection from weather conditions taking into consideration prevailing wind direction, splashes from passing vehicles and protection from the sun. Shelters will provide a safe and comfortable waiting area for users, in particular shelters will be well lit and allow sufficient ventilation to avoid overheating. Shelters will be visible to the surrounding environment and community. Shelters will not obstruct other area users such as pedestrians and cyclists and allow sufficient room for wheelchair users and those with prams / buggies to pass with ease Shelters will have up-to-date timetabling information prominently on display in the shelter. Shelters will provide sufficient seating for the users of the development for all ages and disabilities, as judged through the consultation with service providers and the local authority. Street furniture will not be positioned where boarding / alighting is expected. Street furniture (apart from seating) should not be situated within the waiting area. Secure cycle parking structures are provided near the public transport shelters/facilities to allow for transfer between modes of transport. The number of cycle					£15,000/shelter		assumes large, semi enclosed space

	spaces accommodated should be determined by the likely users identified in the transport assessment.							
Aspirational	Compliant / Best Practice PLUS: Litter bins will be provided by each shelter, positioned to avoid any interference with the use of the shelter. Regular refuse collection is negotiated with the local authority. Shelters will have real-time timetable information feeds Where the consultation identifies a significant risk of vandalism, CCTV that covers the shelter and surrounding area should be installed and the shelter should be constructed of vandal resistant materials A renewable energy supply (with a storage capacity to work after dark) will be used to power the shelters lighting and real-time timetabling displays.					£30000/shelter		assumes real time displays & large, semi enclosed space - CCTV & solar panels

7. Materials and Resources

The environmental impact of materials and resources used during construction is significant to the whole life carbon performance of a development. Early commitment to reducing the embodied carbon and environmental impact of materials and resources and considering sourcing, conservation and re-use and help deliver a more sustainable outcome. Utilising materials that are also local and resilient can reduce longer term negative environmental impacts.

7.01 - To what extent will the development promote the use of materials with a low embodied environmental impact?

The choice of materials and consideration of embodied environmental impact (including embodied carbon) can have a significant bearing on the sustainability performance of a development. The design of development should prioritise materials that have a low embodied energy, including those that can be reused intact or recycled. The Green Guide to Specification is the recognised industry guidance on the environmental impact of materials and covers climate change, mineral resource extraction, stratospheric ozone depletion, human toxicity, ecotoxicity to freshwater, nuclear waste (higher level), ecotoxicity to land, waste disposal, fossil fuel depletion, eutrophication, photochemical ozone creation, and acidification.

Compliant / Standard Practice

The design of development prioritises materials that have a low embodied energy.

At least three of the key elements of the building envelope (external walls, windows roof, upper floor slabs, internal walls, floor finishes / coverings) will achieve a rating of A+ to D in BRE's The Green Guide to specification.

At least 100% of timber and timber products used within the development will be from an accredited Forest Stewardship council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source.

Relevant Policy / Guidance

- Birmingham Development Plan

Best Practice

Buildings will achieve the maximum number of BREEAM credits for Life Cycle Impacts at the Building Level.

Relevant Policy / Guidance

- Birmingham Development Plan

Aspirational

The development has an established database of materials, with product LCA undertaken for significant components. These contribute to the project goals of being Zero Emissions.

Relevant Policy / Guidance

- Birmingham Development Plan

Who is accountable for delivering this?

- Uyen Phan-Han
- Josie Turner

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

Whole Life Value Assessment

What are the cost implications of compliance? The specification of materials with strong sustainability credentials will potentially incur an additional capital cost where the contractor supply chain defines these as beyond normal practices. Dependent on the availability and cost of 'standard' materials will dictate the
level of cost increase, as will the volume of materials used. This is difficult to quantify at this time.
What are the cost implications of moving beyond compliance? The cost increase of achieving Best Practice is, in line with the above, directly related to the volume of material used and the availability of this. If these materials are considered 'standard practice' by the contractor then it will not represent an additional capital cost. Costs incurred in the supply chain are difficult to quantify with the level of detail currently in the masterplan.
What is the value of moving beyond compliance? The value of compliance will tie into the wider value of delivering buildings certified to high environmental standards. This will represent a brand value enhancement as it occupies buildings that are recognised as being sustainable. Where some materials are less proven, or where their installation requires specialist input, the durability and long term maintenance of these may incur additional cost. As such, a detailed understanding of Cost, Performance and Sustainability needs to be understood in relation to each material prior to specification. In materials specification, whole life value is derived from standardisation and durability. In addition, Birmingham Smithfield will require assurance that items specified will be available and affordable across the lifetime of the development. Where items specified are not standard they may be harder to procure in future or more expensive.

Whole Life Value		
Economic		
Social		
Environmental		

7.02 - To what extent will the development promote the use of materials that are responsibly sourced?

Responsible Sourcing of Construction Products provides a holistic approach to managing a product from the point at which component materials are mined or harvested, through manufacture and processing.

Compliant / Standard Practice The development prioritises materials from suppliers who participate in responsible sourcing schemes such as the BRE BES 6001:2008 Responsible Sourcing Standard.	**Relevant Policy / Guidance** • BRE BES 6001:2008 Responsible Sourcing Standard.
Best Practice Stretch targets will be set to specify materials from suppliers who participate in responsible sourcing schemes such as the BRE BES 6001:2008 Responsible Sourcing Standard.	**Relevant Policy / Guidance** • BRE BES 6001:2008 Responsible Sourcing Standard.
Aspirational Where greater than 80% (by volume or weight) of the materials (used in the public realm) on-site achieve an A+ to B rating, as defined in the Green Guide to Specification.	**Relevant Policy / Guidance** • http://www.breeam.com/bre_PrintOutput/BREEAM_Communities_0_1.pdf

Who is accountable for delivering this?

- Uyen Phan-Han / Josie Turner

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Whole Life Value Assessment

What are the cost implications of compliance? Responsibly sourced materials ensure that products are managed from the point of origin, through manufacture and processing to use on site. Without clear guidance on the extent to which the specification of materials accredited under this standard it is impossible to provide comment on the potential cost implications this represents. The development should engage with its supply chain to understand the extent to which they are able to source materials under this scheme, the volume this represents and any potential additional cost to fully understand the implications. It may be that contractors are engaged with their supply chain and are able to procure accredited materials.
What are the cost implications of moving beyond compliance? Moving to stretch targets needs to be understood in light of the building / site specification and the extent to which the supply chain can source sustainable materials.
What is the value of moving beyond compliance? At this stage of design, it is only possible to identify the intangible benefits of using sustainably sourced materials. Broadly speaking this means the supply chain of the material is traceable. The development may consider alternative options to motivate the supply chain to operate more sustainably, including setting stretch waste performance targets and financial incentives and penalties to reduce waste.
It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for using responsibly

Whole Life Value		
Economic		
Social		
Environmental		

7.03 - Will the masterplan promote the efficient use of land through developing brownfield land and remediating contaminated land?

Land is a valuable resource, utilising brownfield land and remediating contaminated land for development is a more efficient use of land than developing greenfield sites that could be used for other productive purposes such as agriculture and the provision of ecosystem services.

Compliant / Standard Practice

The development prioritises construction on brownfield / grey field land.

The site will be investigated, assessed and remediated in accordance with local planning requirements and regulations.

Relevant Policy / Guidance

- http://www.claire.co.uk/index.php?option=com_content&view=category&id=963&Itemid=78

Best Practice

Compliant / Standard Practice PLUS:

Where applicable contaminated land is restored and brought back into use through remediation processes.

Relevant Policy / Guidance

- http://www.claire.co.uk/index.php?option=com_content&view=category&id=963&Itemid=78

Aspirational

The remediation strategy for the site adheres to SURF Best Practice Guidance.

Relevant Policy / Guidance

- http://www.claire.co.uk/index.php?option=com_content&view=category&id=963&Itemid=78

Who is accountable for delivering this?

- Uyen Phan-Han / Josie Turner

Link to SDG's:

3 Ensure healthy lives and promote well-being for all at all ages

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

12 Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Whole Life Value Assessment

What are the cost implications of compliance? The site is brownfield and as such this represents no additional cost. If the land needs to be remediated, then this is an additional cost which will have to be incurred to allow development to go ahead.
What are the cost implications of moving beyond compliance? Where the land requires remediation this will incur additional cost. Ensuring this material is remediated on site and not simply removed for disposal will incur additional cost.
What is the value of moving beyond compliance? The value is dependent on the extent of remediation. Where the site is found to be contaminated it will not be able to be developed and as such will require remediation. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for developing brownfield land and remediating contaminated land could be a mixture of economic, social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

7.04 - Does the masterplan incorporate local / regional materials?

Regeneration projects can serve as a catalyst for wider economic benefit. The specification of local / regional materials can accelerate this. There are additional benefits. Reducing the vehicle miles associated with the delivery of materials has broader sustainability benefits. Local materials can also better reflect the local vernacular and provide a connection between modern and historic buildings.

Compliant / Standard Practice

A design guide will be developed for Smithfield which promotes the use of consistent palettes and materials that link to the identity of Birmingham. This includes the delivery of a procurement framework for materials and resources

Relevant Policy / Guidance

- Birmingham Business Charter for Social Responsibility
- London 2012: http://learninglegacy.independent.gov.uk/themes/procurement/

Best Practice

10% of materials (to include aggregates) specific in Smithfield will be from within a 50 mile radius of the Greater Birmingham area.

Relevant Policy / Guidance

- Birmingham Development Plan

Aspirational

25% of materials specific in Smithfield will be from within a 100 mile radius of the Greater Birmingham area.

Relevant Policy / Guidance

- Birmingham Development Plan

Who is accountable for delivering this?

- Uyen Phan-Han / Josie Turner

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

Whole Life Value Assessment

What are the cost implications of compliance? A Design Guide for a development of this scale should form a central pillar of the masterplan design process. This should highlight a consistent approach to materials utilised within the development that reinforces it as a destination within the centre of Birmingham. This design guide should support the development to integrate within the centre of Birmingham, being consistent with other materials in the local area. Where possible this should utilise local materials to support the local economy and preserve the historical elements of the site.
What are the cost implications of moving beyond compliance? The specification of local materials may incur some additional capital cost where these aren't sourced from cheaper markets.
What is the value of moving beyond compliance? The specification of local materials has the potential for the development to serve as a catalyst for the regions economy.

Whole Life Value		
Economic		
Social		
Environmental		

7.05 - Will the development undertake an embodied carbon assessment?

Minimising the environmental impact of resources used in construction can significantly lower the environmental impact of development. Understanding the embodied carbon impact of materials specification and setting strategies to reduce this can support low carbon development.

Compliant / Standard Practice

The developer has committed to the delivery of an embodied carbon assessment for major construction elements. This will include, as a minimum:

- Concrete.

This is conducted at the Design Stage with strategies in place to reduce the embodied carbon impact of the materials specification.

Relevant Policy / Guidance

- Birmingham Development Plan

Best Practice

In addition to Compliant / Standard Practice, this will include:

- Steel
- Aggregate
- Plastic

This is conducted at the Design Stage with strategies in place to reduce the embodied carbon impact of the materials specification.

Relevant Policy / Guidance

- Birmingham Development Plan

Aspirational

In addition to Best Practice, this will include:

- Timber
- Glass
- Composites

This is conducted at the Design Stage with strategies in place to reduce the embodied carbon impact of the materials specification.

Relevant Policy / Guidance

- Birmingham Development Plan

Who is accountable for delivering this?

- Uyen Phan-Han / Josie Turner

Link to SDG's:

12. Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Whole Life Value Assessment

What are the cost implications of compliance? A Whole Life Carbon assessment can support developers in identifying strategies that will reduce the total carbon impact of a development. This isn't new in terms of assessing component parts as BREEAM utilises the Green Guide to assess such issues. However, early consideration of this has the potential to deliver significant environmental savings.
What are the cost implications of moving beyond compliance? Moving any assessment beyond just concrete has the potential to provide additional savings. There would be minimal additional cost over any initial cost to incorporate these additional elements. This would however require an expert in undertaking this type of assessment to realise its potential. It would also need the engagement of the design team to ensure any issues / risks identified can be mitigated.
What is the value of moving beyond compliance? Any value generated will be identified in the design process. The UKGBC have identified the potential to save between 30% – 50% of capital cost through tracking embodied carbon: http://www.ukgbc.org/sites/default/files/Tackling%20embodied%20carbon%20in%20buildings.pdf.

Whole Life Value		
Economic		
Social		
Environmental		

7.06 - To provide easy access to site service and communications infrastructure, with minimal requirement disruption and need for reconstruction, and allowing for future growth in services.

Design measures that reduce disruption across a development lifecycle can contribute to usability. This can also reduce noise and nuisance and additional resource consumption.

Compliant / Standard Practice

Provision of a single point of access for each service running through the site.

Relevant Policy / Guidance

- Birmingham Development Plan

Best Practice

The following service providers have committed to the coordinated installation of related infrastructure, as relevant:

- Gas;
- Electricity;
- water /sewerage;
- telecommunications / internet;
- Heat and cooling (where relevant).

Access to the service(s) is provided away from any circulation routes on site.

Individual service providers have committed to provide access to the network(s) for maintenance which will not severely interrupt customer supply or cause unnecessary disruption, expense or nuisance to either the public domain or to the occupiers or their neighbours.

Relevant Policy / Guidance

- Birmingham Development Plan

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Uyen Phan-Han / Josie Turner
- Varinder Raulia

Link to SDG's:

No direct link.

Whole Life Value Assessment

What are the cost implications of compliance? There should be minimal additional cost in providing a single point of access for utilities providers. This should however be considered within the wider context of Birmingham and how best to minimise any potential future disruption to residents. This will also need to be in compliance with the utilities providers own policies and strategies.
What are the cost implications of moving beyond compliance? Locating services away from circulation routes reduces disruption to residents. It can reduce lifecycle costs as any invasive works do not require extensive groundwork.
What is the value of moving beyond compliance? There is more social than monetary value in delivering this requirement. Reducing disruption to residents will support the quality of Smithfield and ensure it remains as a quality place to live.

Whole Life Value		
Economic		
Social		
Environmental		

8. Community and Culture

Community engagement can support the delivery of a successful project. By engaging with stakeholders. project proposers can gain insight into the demands and challenges of a specific site and respond directly to people's concerns and 'wants' from a new development. This includes building capacity, ownership and leadership within the district to enable implementation of shared goals.

8.01 - To what extent will consultation take place with local communities and key stakeholders at the pre-application stage?	
Consultation with local communities and key stakeholders at the pre-application stage can allow for community views and user needs to influence the design of the masterplan. This can lead to positive outcomes such as the enhanced delivery of user needs and greater community support for the development proposal.	
Compliant / Standard Practice The design team have engaged with the community before submitting a planning application and in line with the approach encouraged by Birmingham City Council: • Public exhibitions - these are run by the applicant and typically give residents the opportunity to see and comment on emerging proposals. • Planning Forums - these are organised by the council. Representatives from local resident and amenity groups, and community network organisations, and ward councillors are invited to participate in a round table discussion with the applicants, facilitated by an independent chair person.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Best Practice An independently facilitated public workshop or series of public workshops are carried out to inform the development of the masterplan. The outcomes of the consultation process influence the design of the masterplan, where the outcomes do not influence the design; the reasoning for this is justified. Following consultation, feedback is provided to the consultation group.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

A consultation plan is in place and the local authority has been consulted about the plan. Consultation should take place early enough in the process for the community and stakeholders to influence key decisions. This may be during the pre-application stage of the planning system. The plan includes timescales and methods of consultation, clearly identifying:

- at which points the community and other stakeholders could usefully contribute
- how they will be kept informed about progress on the project
- how and when feedback will be provided
- about how consultation input will be taken into account
- a named person who is responsible for delivering the consultation activities and championing the outcomes in the project team together with their contact details
- the approach that will be taken to target and provide for minority and 'hard to reach 'groups (e.g. elderly, youth, disabled and those with limited time to participate).

A design workshop was used as part of the community and stakeholder involvement / consultation process.

The city has implemented measures to involve different administrations (infrastructure, planning, environment, health) and stakeholders (developers, local community) in urban development projects in order to achieve integrated urban development projects.

The developer has committed to include 3D modelling / visualisation of the development site to support engagement to help people understand the site context.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Josie Turner

Link to SDG's:

16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all

16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels

17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

17.16 Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries

Whole Life Value Assessment

What are the cost implications of compliance? Community engagement does not represent an additional capital cost but may require funding in the design stage. This will require additional time and potentially increase professional fees associated with project delivery.
What are the cost implications of moving beyond compliance? Over and above public exhibitions and planning forums an independently facilitated workshop will incur additional professional fees and time in project delivery. Where this is undertaken and feedback is provided to stakeholders' additional time and cost may be incurred.
What is the value of moving beyond compliance? Whilst potentially a direct cost, public engagement has the potential to engage people with the development plans and reduce any negativity / objection to development going ahead and derive benefit for both the development and the local community). The project will need to go through a complex planning process and community engagement can help smooth this with an effectively managed approach to mitigate concerns and reduce any potential delays. This then reduces the costs associated with planning permission being granted and can deliver long term support from the local community (although there could be additional costs related to implementing specific community aspirations). Engaging with key stakeholders during the design stage to consider operations and maintenance can add significant value. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for consultation take place with local communities and key stakeholders will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

8.02 - Does the masterplan make adequate provision for the day to day shopping and service needs of future, workers, residents and other users of the development?

Providing for day to day shopping and service needs will enhance the user experience and create a more vibrant development that serves the day to day needs of a new community. It also offers the opportunity to address existing gaps within the local economy.

Compliant / Standard Practice

The future community will have access to local shops and services to provide for day to day needs.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

Local shops and services to provide for day to day needs will be co-located with other local facilities at the most accessible locations.

The opportunity for creating a vibrant local centre with supporting uses (e.g. local shopping, restaurants and community facilities) has been fully considered and integrated into the masterplan in the most appropriate way.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

Not Set.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

Josie Turner

Link to SDG's:

2. Zero Hunger: end hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

12 Ensure sustainable consumption and production patterns

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

Whole Life Value Assessment

What are the cost implications of compliance? There will be an additional cost incurred through providing a range of retail premises within the development. This may be as a result of small units requiring additional services etc. There may be an increase in income from rental fees if these units can be demonstrated to deliver value to potential tenants / occupiers.
What are the cost implications of moving beyond compliance? Locating shops at the most accessible locations will support their viability.
What is the value of moving beyond compliance? Providing premises that respond to local need will provide a range of benefits. Locating shops at the most accessible locations will also increase foot fall and positive perceptions of the development as a destination. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the needs of future students, workers, residents and other users of the development will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

8.03 - Does the masterplan seek to design out crime and ensure community safety?

The design of a development can have a significant influence on the occurrence and perception of crime within that development. This is a design measure and therefore needs to be addressed and emphasised at an early stage in the design process.

Compliant / Standard Practice

Measures to design out crime are integral to the masterplan and are considered early in the design process. This includes:

- Access and movement: places with well-defined routes, spaces and entrances that provide for convenient movement without compromising security.
- Surveillance: places where all publicly accessible spaces are overlooked.
- Ownership: places that promote a sense of ownership, respect, territorial responsibility and community.
- Activity: places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times.
- Management and maintenance: places that are designed with management and maintenance in mind, to discourage crime in the present and the future.

The development contributes to measures to ensure community safety in Birmingham including the provision of CCTV and linking with the city CCTV network.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

Compliant / Standard Practice PLUS:

The mix of land uses at Smithfield is carefully considered to add to its vitality and security whilst minimising conflict between incompatible activities. Day time and night time uses are carefully planned to ensure that spaces are active and informally monitored.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational	Relevant Policy / Guidance
Within the development's traffic management plan, targets have been set regarding road traffic accident reduction and these targets have been agreed and informed by the local authority, highway authority and / or police authority. A maintenance contract will be in place for external areas that are not covered by the local authority for at least the first five years from the time the development is occupied.	• http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Josie Turner
- Acivico

Link to SDG's:

16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all

16.1 Significantly reduce all forms of violence and related death rates everywhere

16.a Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime

Whole Life Value Assessment

What are the cost implications of compliance? Design measures that explicitly address safety should represent no additional cost. Connection to the local CCTV infrastructure may require financial support. According to the Home Office, the economic and social cost of crime cover three main categories, these are:

- Costs in anticipation of crime: e.g. crime deterrent measures;
- Costs as a consequence of crime: e.g. the physical and emotional impact on victims, value of property stolen or damaged; and
- Costs in repose to crime: e.g. the Criminal Justice System and Police.

It may be that reducing the levels of crime also reduces the cost of insurance and policing on the site. Low level crime, including graffiti, may also be reduced. This will reduce the cost of cleaning and improve the perception of the development

What are the cost implications of moving beyond compliance? There may be an additional cost in providing compatible uses close to each other as this may require a specific design solution.

What is the value of moving beyond compliance?

It is considered that the whole life value benefit to Birmingham City for moving beyond compliance for designing out crime and ensuring community safety will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

8.04 - Does the masterplan contribute to the provision of necessary community meeting space for the future population and local community?	
The provision of a new Community Centre will support the new community of Smithfield and provide a meeting space for existing local community groups. There is an opportunity to provide new meeting space within Smithfield with engagement of potential users to identify how this space should be designed and managed.	
Compliant / Standard Practice The masterplan contributes toward the provision of an integrated community meeting space / asset in Smithfield. The aim of the community asset is to allow different community groups a place to meet.	**Relevant Policy / Guidance** http://www.birmingham.gov.uk/plan2031/evidencebase
Best Practice The masterplan provides integrated community meeting space in a location that is highly accessible for potential users. There is a commitment to work with providers of existing and proposed community facilities in Birmingham to establish the need for community meeting space. This should be considered for the general population as well as for particular sectors such as young people, elderly people, or specific ethnic communities. The potential for the masterplan to provide a Community Centre has been fully explored and provision is made where appropriate. This should be considered in line with existing and proposed community facilities in the area.	**Relevant Policy / Guidance** http://www.birmingham.gov.uk/plan2031/evidencebase
Aspirational Evidence demonstrates that existing community groups were consulted over the design and location of the proposed community centre, with design measures incorporated reflecting their input. In addition there is a long term strategy in place for an Activated public realm with funding available for a specific number of annual events held within Smithfield.	**Relevant Policy / Guidance** http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Josie Turner

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? Providing a community meeting space will incur a slight capital cost to the development, which may be in the provision of actual space on-site or alternatively in the financial contribution to space elsewhere in the local community. There may also be a maintenance cost incurred in managing this community asset. Funding for this could be part of a community outreach programme.
What are the cost implications of moving beyond compliance? Locating a community facility in a centrally accessible location may remove another use from this. This may incur a perceived cost via displacing a more valuable building use.
What is the value of moving beyond compliance? Delivering a community asset will support local perception of the development. It will also engage local users to explore the development site and contribute to other uses beyond academic functions. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the provision of community meeting space for the future population and local community will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

8.05 - Will partners support the education of residents as to the sustainability features of the new development?

The long term sustainability aspirations of Smithfield will be supported through sustainable lifestyles. Providing the infrastructure for new residents and ensuring they understand how to fully optimise this will support this long term vision.

Compliant / Standard Practice

A Development User Guide is provided to all new residents of Smithfield. This will include instructions on all the sustainability features of the development.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

A program of Post Occupancy Surveys is committed to. The aim of this is to understand how residents find the facilities provided to them and whether they are using these within their design intent.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Josie Turner
- Birmingham Property Services

Link to SDG's:

4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

Whole Life Value Assessment

What are the cost implications of compliance? Providing education to local residents will incur a small capital cost to the development, which will be In the shape of a Development User Guide. There may also be an ongoing cost incurred in updating the guides as time progresses. Funding for this could be part of a community outreach programme.
What are the cost implications of moving beyond compliance? The program of Post Occupancy Surveys will incur ongoing costs to ensure the progressive upkeep of the program.
What is the value of moving beyond compliance? Ensuring the community has a good understanding of the asset's sustainability credentials will contribute to the community acquiring the knowledge and skills needed to promote sustainable development. It will also engage local users to explore the development site and contribute to other uses beyond academic functions. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the provision of community meeting space for the future population and local community will be predominantly social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

8.06 - What measures will be taken to reduce the impact of construction on local communities?

Construction can have a significant impact on local communities and businesses, causing disruption through increased traffic flows, noise and dust. Measures should be put in place to reduce this potential disruption.

Compliant / Standard Practice

The developer has committed to the delivery of a Construction activity pollution control plan that will reduce the impact of construction on local communities and surrounding infrastructure. Issues that will be addressed will include:

- Noise;
- Transport Impacts;
- Dust;
- Hours of operation.

This in compliance with The Birmingham City Council Environmental Protection Unit Guidance on Noise and Dust from Construction and Demolition Works.

Relevant Policy / Guidance

- Environmental Protection Unit
- BS5228 Noise Control on Construction and Open Sites

Best Practice

Compliant / Standard Practice PLUS:

The developer has committed to delivering an effective communication plan that details activities during the construction process. This includes a public web-site that allows local residents to identify issues and a resolution process for these.

Relevant Policy / Guidance

- Environmental Protection Unit
- BS5228 Noise Control on Construction and Open Sites

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Josie Turner
- Mark Wolstencroft

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? Ensuring that good construction practices are adhered to will reduce the impact upon residents but will not incur additional cost as contractors must adhere to the Birmingham City Council Environmental Protection Unit Guidance. This will be part of the contractor's requirements for the project.
What are the cost implications of moving beyond compliance? Similarly, by going beyond compliance, the contractor is already complying with the Birmingham City Council Environmental Protection Unit Guidance.
What is the value of moving beyond compliance? By reducing the impact upon local communities and businesses, measures will mean that there is less impact on traffic flows, less noise and pollution. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the provision of community meeting space for the future population and local community will be predominantly social and environmental.

Whole Life Value		
Economic		
Social		
Environmental		

8.07 - Does the public realm incorporate local art / sculptures?

The integration of art and sculptures into the public realm can support the place making of a new development. This can also support the local vernacular and usability / legibility of the development for users.

Compliant / Standard Practice

The developer has committed to the integration of public art within the public realm. This is included within a Design and Access Statement and supports wayfinding across the development.

Relevant Policy / Guidance

- Birmingham Development Plan

Best Practice

Compliant / Standard Practice PLUS:

- Public art is integrated at transit stops.

Relevant Policy / Guidance

- Birmingham Development Plan

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Simon Dellerhunty-Forrest
- Josie Turner

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? Integration of public art will incur additional costs to the developer but this depends on the amount of art required and who is providing it. The costs can be reduced by working in association with local art colleges.
What are the cost implications of moving beyond compliance? As with being compliant, the costs will depend on the amount of art and who is providing it.
What is the value of moving beyond compliance? Providing public art to the area provides a range of benefits, with the focus on local artists boosting the local art scene and providing a platform to showcase work. By having local art in specific areas it can provide a cultural identity to the site. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the provision of community meeting space for the future population and local community will be predominantly economic and social.

Whole Life Value		
Economic		
Social		
Environmental		

8.08 - To ensure that heritage or archaeologically important features are conserved or preserved.	
To protect the heritage and cultural significance of the Smithfield site.	
Compliant / Standard Practice Record, protect and enhance heritage assets in a manner appropriate to their significance so that they can continue to contribute to the quality of life now, and for future generations. This should be undertaken through recording of the asset and careful management, in accordance with the requirements of the designation of the specific heritage asset, including UNESCO World Heritage Sites, Schedule Ancient Monuments, Archaeology, Listed Buildings, Registered Parks and Gardens, Registered Battlefields, Conservation Areas, Ecclesiastical Buildings Locally Listed Buildings, National Parks, the Broads and Areas of Outstanding Natural Beauty, as well as any other non-listed assets of heritage significance.	**Relevant Policy / Guidance** • National Planning Policy Framework, Department for Communities and Local Government, 2012, and supporting legislation • Ancient Monuments and Archaeological Areas Act 1979 • Planning (Listed Buildings and Conservation Areas) Act 1990 • The Historic Buildings and Ancient Monuments Act 1953 • The Town and Country Planning Act 1990 The Ecclesiastical Exemption (Listed Buildings and Conservation Areas) Order 1994
Best Practice Consideration should also be given to intangible forms of heritage within the community. Seek opportunities to conserve and where appropriate enhance the significance of heritage assets and the contribution of their settings. Significant adverse effects should be avoided altogether and alternatives sought to reduce or mitigate unavoidable adverse impacts. The historic environment should be integrated within any regeneration and renewal proposals. Ensure that physical interventions of buildings and objects are undertaken in accordance with best practice guidance.	**Relevant Policy / Guidance** • The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter), ICOMOS Australia, 1996 • Historic England (2008) Historic England Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment. • Historic England (2012) Heritage Works – The Use of Historic Buildings in Regeneration (A Toolkit of Good Practice) • For example, not exhaustive of: BS 7913:2013 Guide to the Conservation of Historic Buildings; RICS (2009) Historic Building Conservation
Aspirational Work with the local planning authority and historic England to understand the significance of the designated heritage asset and to create a more comprehensive listing record for that asset and provide a more useful decision making tool for the future management of that asset.	**Relevant Policy / Guidance** • Enterprise and Regulatory Reform Act 2013 • Convention for the Safeguarding of the Intangible Cultural Heritage 2003 (UNESCO 2003)

Embrace a holistic approach to managing the values of tangible and intangible cultural heritage in historic urban centre, early on within the project. Seek opportunities to understand and celebrate the heritage of the area in tandem with local stakeholders. Early appointment or engagement with a heritage practitioner to ensure early identification of the needs of the heritage assets within the site.	• Recommendation on the Historic Urban Landscape, including a glossary of definitions (UNESCO 2011)

Who is accountable for delivering this?

- Josie Turner
- BCC Archaeologist

Link to SDG's:

8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products

11 Make cities and human settlements inclusive, safe, resilient and sustainable

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage

Whole Life Value Assessment

What are the cost implications of compliance? The costs of compliance will depend greatly on the needs of the site with regards to its archaeological importance. Depending on what is needed, costs will be incurred through recording of the asset and careful management, in accordance with the requirements of the designation of the specific heritage asset.
What are the cost implications of moving beyond compliance? Similarly, going beyond compliance will depend greatly on the significance of the site and what processes need to followed to enhance and conserve the assets and their significance.
What is the value of moving beyond compliance? By enhancing and protecting the heritage of the site, can help develop the policies which will promote sustainable tourism and create jobs. It will help promote local culture and products that are synonymous with the area. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the provision of community meeting space for the future population and local community will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

9. Local Economy

Promoting local job creation and responding to local skills can support Smithfield as a catalyst for economic growth. This needs to respond directly to the Midlands Engine plans and the future employment market forecast. This will include the creation of opportunities for training and education and job creation. This will address unemployment in the wider region and address identified skills gaps within the Birmingham economy.

9.01 - Will the development improve access to and increase numbers of work experience, trainee and apprenticeship opportunities?

The development responds directly to the Midlands Engine plans and priorities providing a range of employment and training opportunities for the local population. This includes providing jobs for skilled labour and providing training opportunities for those out of work. Creating traineeships and opportunities for local labour promotes inward investment in the scheme and supports the local economy.

Compliant / Standard Practice

An economic study is completed and clearly identifies the needs and opportunities within the local area and surrounding economy. This study should be focused on understanding how the proposed development can enhance the economic wellbeing of future occupants. It should also ensure that the development complements and enhances existing economic activity in the local area. For solely domestic developments this study should identify potential employment and training opportunities for future residents.

The masterplan sets out actions to secure local employment and training benefits and to maximise opportunities available to the local community.

This includes:

- Target a minimum of 15% of construction jobs to be on a traineeship basis and 10% on an apprenticeship basis;
- Target 15% of all labour used on the developments should live within a 25 radius of the development;
- Raise aspirations and awareness of job possibilities and career paths amongst school age and young people and develop links with educational and learning institutions;
- Improve access to and numbers of work experience trainee and apprenticeship opportunities.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Birmingham Development Plan
- Birmingham Skills Strategy

Best Practice

Compliant / Standard Practice PLUS:

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

The developer will partner with a training provider to promote and contribute to a legacy of local training and skills opportunities for residents and businesses in the development and wider area. The local training and skills opportunities will align with those identified through consultation.	
Aspirational BCC have identified a range of specific skills gaps within Birmingham that could be addressed through the development. A long term plan is established to identify how these gaps can be closed as a result of Smithfield with a financial commitment made to support long term training initiatives.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Who is accountable for delivering this? • Josie Turner • Shilpi Akbar	
Link to SDG's: **4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all** **4.3** By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university **4.4** By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship **8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.** **8.2** Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors **8.3** Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services **8.4** Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead	

8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training

Whole Life Value Assessment

What are the cost implications of compliance?
Where identified by contractors as an additional requirement the cost may be passed on. In terms of direct cost, then trainees / apprentices require additional support through monitoring and training and so do represent a cost. However, where this is identified as core to a contractors business as increasing the skills of their workforce then again this should fall within their budgets.
What are the cost implications of moving beyond compliance? Further to compliance, where the project engages a local training provider this may represent an additional cost in terms of time for engagement. This is negligible in relation to total cost. Where there are identified skills gaps within the local population that the development can fill then the project may consider contributing to the costs associated with improving this for local training providers, contractors or local authorities. There is the potential for this issue to not represent value where local people are not available to work on the site or local demographics cannot meet the numbers of people to meet the requirement.
What is the value of moving beyond compliance? The development represents a major element of regeneration within the Birmingham area and as such represents a significant opportunity to engage local people as a source of labour. Where the local pool of labour is identified as having a skills gap then the development represents an opportunity to provide this training. This has the financial benefit of training and offering employment to people and retaining the financial benefit of the development in the local economy. This also offers the potential to increase the positive perception of the development during construction, replacing the cost of promotion of the site or dealing with objections. These should be considered in light of the socio-economic benefit of the site both in construction and over its lifetime. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to improve access to and increase numbers of work experience, trainee and apprenticeship opportunities will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

9.02 - Does the masterplan incorporate a range of business premises with a range of sizes and tenancy agreements to contribute to Birmingham's economy?

Provision of a range of business premises will promote a varied offering for development users. Providing a variety of business space will promote the development as an ideal location for local small businesses and potentially foster a knowledge based community around Smithfield.

Compliant / Standard Practice

The masterplan promotes and contributes to the continued development of a strong, sustainable and increasingly diverse economy in Birmingham, ensuring the availability of sufficient and suitable workspaces in terms of type, size and cost, supporting infrastructure and suitable environments for larger employers and small and medium sized enterprises.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

The masterplan provides flexible, scalable workspace and facilities to accommodate each stage of a company's growth from early-stage through to maturity.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

The development promotes knowledge sharing across the Midlands Engine with an established Local Business Network. This includes reviewing how the development promotes the Circular and Sharing Economy for the benefit of the Midlands Engine.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Josie Turner

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? The project provides a balance of economic uses will support a diverse local economy. This may attract additional capital cost in providing smaller retail units or workspaces with additional infrastructure to support these. By increasing the numbers of people working in and around the development there is the potential to increase the viability of some commercial uses. These may however need to be located in 'prime' locations on the site. This has the added benefit of potentially increasing rates.
What are the cost implications of moving beyond compliance? Identifying the needs of local businesses and providing a range of spaces suitable for their needs may attract additional capital costs. Where businesses have differing needs in order to grow whilst remaining in the locality this may attract additional capital cost.
What is the value of moving beyond compliance? Providing space for local businesses will require additional cost to identify their needs and engage them to ensure space provision meets their needs. In addition, ensuring this is maintained over the lifetime of the development may attract additional maintenance costs. However, the retention of people and businesses in the local area has the potential to provide localised socio-economic benefits.
It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for a range of business premises contributing to Birmingham's economy will be predominantly economic and social.

Whole Life Value		
Economic		
Social		
Environmental		

9.03 - Does the development support agile working?

The concept of a '9-5' office is increasingly fading with new demands and requirements placed on businesses to reflect changes in workforce needs. Smithfield should provide a range of flexible facilities that promote flexible working. This will include live-work units.

Compliant / Standard Practice

The masterplan incorporates a range of 'live-work' units that respond directly to the needs of local small businesses and forecast start-ups.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

The scope of the proposed development, including housing mix, community facilities and employment opportunities, has been informed by a review of the current demographic profiles and future trends of the local area. The study has been conducted based on the following: economic impact study policies and evidence in the local and neighbourhood development plans relevant local authority strategies detailed consultations with the members of the local community including local residents, businesses, schools, community groups and other members of the community and parish councils.

The community is consulted on the local needs and requirements that are desired as part of the proposed development. Their views are used to prioritise the local needs and requirements in order of desirability (low, medium and high).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

Not Set.

Relevant Policy / Guidance

Who is accountable for delivering this?

- Josie Turner

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? The provision of live-work units should be incorporated within the development mix. This will provide the basis for a balanced community within Smithfield and ensure the development caters for potential residents. There should be minimal additional capital cost associated with the delivery of a percentage of units designed to meet these requirements. These may also attract sales / rental premiums and thus deliver longer term gains.
What are the cost implications of moving beyond compliance? Any additional community consultation may incur some additional cost but has the potential to create longer term value. Where the consultation exercise is collaborative and identifies the needs of the local community Smithfield has the potential to be better integrated. This has the potential to ease any tensions in the local community about the impact of the development as it will be seen as having the potential to improve long term quality of life.
What is the value of moving beyond compliance? Public consultation exercises that are more collaborative than traditional approaches are proven to deliver reductions in local objections, smoothing the planning process. In addition, where the process responds directly to community input it can serve as a long term catalyst to growth.

Whole Life Value		
Economic		
Social		
Environmental		

9.04 - To attract inward investment from businesses and organisations from outside the immediate area to increase economic well-being.

Regeneration can act as a catalyst for economic growth. Ensuring this optimises opportunities for local businesses and supports future economic growth will support Smithfield remain a key destination within Birmingham.

Compliant / Standard Practice

The development has a dedicated economic plan to target the Birmingham (combined authority targets) growth sectors of:

- Advanced engineering – automotive and aerospace;
- Business, financial and professional services;
- ICT & Digital Media;
- Life Sciences;
- Food and Drink;
- Leisure & Retail.

The economic study is completed and clearly identifies the needs and opportunities within the local area and surrounding economy. This study should be focused on understanding how the proposed development can enhance the economic wellbeing of future occupants. It should also ensure that the development complements and enhances existing economic activity in the local area. For solely domestic developments this study should identify potential employment and training opportunities for future residents.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/economy
- http://www.birmingham.gov.uk/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition&blobkey=id&blobtable=MungoBlobs&blobwhere=1223571048741&ssbinary=true&blobheadervalue1=attachment%3B+filename%3D873183Birmingham_LEA_2014.pdf

Best Practice

There will be no net reduction in employment as a result of the development.

The infrastructure and / or facilities within the proposed development will contribute to and/or complement existing business in the area.

The economic study includes a skills gap analysis for the local area.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/economy

Aspirational	Relevant Policy / Guidance
The development will have a positive net gain on employment in the region and local area, through the creation of new employment and / or supporting / enhancing earnings and / or improving productivity. The developer will partner with a training provider to provide training opportunities for local residents and businesses. Opportunities to attract inward investment to the area are included in the development proposal as identified in the economic study or local/sub-regional economic strategies. This refers to infrastructure or development uses that have been identified as lacking in the area, such as transport infrastructure.	• http://www.birmingham.gov.uk/economy

Who is accountable for delivering this?

- Josie Turner
- Business Birmingham

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? The masterplanning process should be supported by an economic study that responds to local characteristics. By responding to the needs and opportunities within the local area and surrounding economy Smithfield can optimise its potential to serve as an engine for growth.
What are the cost implications of moving beyond compliance? Smithfield has the potential to serve as a catalyst for economic development in Birmingham. Making sure that the development optimises this potential ties back to ensuring this responds directly to the local economy. This has the potential to create the greatest long term value.
What is the value of moving beyond compliance? It is difficult to forecast any additional capital cost associated with an economic study. Ensuring the development responds to the outcomes has the potential to create jobs, attract inward investment and ensure the development supports the long term economic stability of Birmingham. This is as much about reinforcing the local economy as creating new opportunities.

Whole Life Value		
Economic		
Social		
Environmental		

9.05 Will the development enable a future proofed digital infrastructure?

The digital infrastructure to provide broadband services has rapidly evolved over the last 10 years, with an ever increasing need for faster broadband speeds and increasing bandwidth, with an ever growing number of connected devices through the growth of internet of things and sensors

Compliant / Standard Practice

Advise telecommunication providers of the development and the telecommunications providers, typically BT or Virgin Media, will install their infrastructure. Standard approach is a Fibre to the Cabinet solution (FTTC).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications
- BCC's ICT and Digital Strategy

Best Practice

- Developers install additional multi-purpose ducting making it available to alternative telecommunication providers and is able to accommodate new modes to data transmission e.g. fibre or other emerging photonic. All ducting is connected to individual premises
- Telecommunications providers are instructed to ensure that FTTP (Fibre to the Premise) solution is deployed
- The provision of free Wi-Fi is made available in all public open spaces

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications
- BCC's ICT and Digital Strategy

Aspirational

- A Multi Utility Service Company (MUSCo) is set up to deploy, monitor and manage the all the utilities (gas, water, electricity, telecommunications) so that civils works are minimised and not duplicated.
- MUSCo provides the platform to enable the monitoring, connectivity between the various utilities and ensures best value, innovative and affordable services.

Relevant Policy / Guidance

- http://www.waterworld.com/articles/wwi/print/volume-17/issue-6/features/multi-utility-new-strategic-approach-or-a-re-invented-concept.html

Who is accountable for delivering this?

- Raj Mack

Link to SDG's:

No Direct Links.

Whole Life Value Assessment

What are the cost implications of compliance? The telecommunications providers will incur any cost in installing their infrastructure, typically a Fibre to the Cabinet solution (FTTC). This will support the connectivity of the site to the latest infrastructure and support connectivity.
What are the cost implications of moving beyond compliance? FTTP (Fibre to the Premise) solution is a more expensive option over FTTC but has the potential to improve connectivity. The creation of a MUSCo will incur additional cost but has the potential to serve as an additional revenue source for Birmingham City Council.
What is the value of moving beyond compliance? The creation of a MUSCo has the potential to create a new revenue stream for Birmingham City Council.

Whole Life Value		
Economic		
Social		
Environmental		

9.06 Is the development able to adapt and measure its impacts and outcomes over its lifetime?

Without the digital tools and data to measure and monitor the outputs and outcomes for the development, it is not possible to make interventions and take correction actions to ensure that development has delivered its agreed outcomes and / or is adapting to emerging opportunities. Linking the development of Smithfield to the wider Digital Birmingham Strategy will support more integrated decision making in the future. This will support the Council in taking this strategy forward and utilising data in a more integrated manner to support better decision making.

Compliant / Standard Practice • Each utility installs their monitoring and management systems in silos • Sensors are deployed on service specific issues and are non-standardised • Data about the development is proprietary and not shared amongst utilities, developers, external organisations, citizens and businesses	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications • BCC's ICT and Digital Strategy
Best Practice • Sensors are integrated within the built environment and public realm to monitor and measure agreed KPIs. • Buildings and homes have sensors and actuators deployed to support facilitates management and optimisation of usage. • Data is openly made available in standard formats and licensed for reuse. • Wayfinding systems are digitalised and provide location and context aware information in real time.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Aspirational • Street based assets are used for multiple purposes e.g. intelligent lampposts as sensors, Wi-Fi hotspots etc. • Sensors are built into roads, open spaces and provide information in real time to enable services such as waste management, gritting, congestion and noise management etc. to be planned, monitoring and delivered in a timely manner • Buildings and homes have sensors and actuators deployed to support facilitates management and optimisation of usage	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications • BCC's ICT and Digital Strategy

• Utilities and other management monitoring systems are developed using open standards and have open APIs to enable systems interoperability • There is a managed digital platform that enables the development to monitor and control the various services being provided e.g. gas, water, electricity so that interdependences can be established and resources can be optimised	
Who is accountable for delivering this? • Raj Mack	
Link to SDG's: No Direct Links.	

Whole Life Value Assessment

What are the cost implications of compliance? Each utilities provider will incur the cost of meeting compliance. Any data that is created should be shared as part of the wider digital strategy for Birmingham. There may be a slight cost increase to provide live transport information but this should be considered standard practice.
What are the cost implications of moving beyond compliance? There should be limited additional cost in moving beyond compliance. Any design elements should be included in the detailed design for individual buildings and within the public realm.
What is the value of moving beyond compliance? The creation of a platform to share and manage data will support a MUSCo. The delivery of infrastructure that supports more smart solutions will deliver long term efficiency gains.

Whole Life Value		
Economic		
Social		
Environmental		

9.07 Can the development be modelled using 3D visualisation and integrated digital modelling techniques?

Traditional developments provide models based on non-standardised proprietary systems in varying formats. There are emerging technologies that are able to visualise and model developments accurately using BIM tools and GIS systems to assess its impact on the existing built environment, use it as a predictive tools for modelling multiple scenarios

Compliant / Standard Practice

- Development is presented as a non-standard, standalone proprietary model and is in a format that is not compatible and cannot be integrated with the existing built environment.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications
- BCC's ICT and Digital Strategy

Best Practice

A digital 3D visualisation model is available using open standards that enable interoperability with other digital models.

Level2 BIM methodologies and GIS modelling tools are used to model every level of the construction from the individual building to whole development.

The digital model has the capability to draw in data from multiple systems, including real time data from sensors.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase - TP 45 Digital Communications
- BCC's ICT and Digital Strategy
- https://gov.uk/government/publications/government-construction-strategy

Aspirational

- Emerging Level 3 BIM methodologies are used to prepare the model
- The model is compatible and can be integrated with existing models so that all developments within the City can be visualised on a single platform
- The model can be used as a predictive planning and information intelligence tool to monitor the delivery of the Development's KPIs.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- https://gov.uk/government/publications/government-construction-strategy

Who is accountable for delivering this?

- Raj Mack

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? The utilisation of BIM in the design process can incur some costs. These are typically associated with hardware / training and so Birmingham City Council should not incur these.
What are the cost implications of moving beyond compliance? As long as a project is set up in a manner that allows the benefits of BIM to be realised, the cost of the investment should be at least met – and probably exceeded. Project teams are certainly becoming more adept at using BIM, with efficient working practices that should negate upfront costs and therefore not make a material difference to overall cost.
What is the value of moving beyond compliance? BIM enables design teams to operate more productively and to produce higher-quality work. In addition, using BIM has shown to reduce waste both in time and in materials, improve project delivery, reduce risk, enhance sustainability and deliver better whole-life performance. Right the way through the asset life-cycle.

Whole Life Value		
Economic		
Social		
Environmental		

10. Health and Wellbeing

The design of a development and its buildings can have direct and indirect impacts on the health and well-being of the community and development users. Promoting healthy lifestyles and providing infrastructure that supports this can support the long term strategic goal of improving the health and well-being of Birmingham residents.

10.01 - Will the development result in improved health care facilities for the local area?

There is an identified need for additional healthcare facilities in Central Birmingham, including the provision of GP surgeries and dental care. Provision of healthcare services would support the worker and resident population of Smithfield and the wider City Centre community.

Compliant / Standard Practice

The development contributes towards the provision of health facilities in the area, either through the masterplan or by financial contributions to existing or proposed facilities.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

The potential for the masterplan to provide a health and wellbeing centre incorporating enhanced primary health care provision and dental services has been fully explored and provision is made where appropriate. This should be considered in line with existing and proposed facilities in the area.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

Best Practice PLUS:

The development includes an Urgent Care Centre for people seeking medical treatment or advice which does not need a visit to A&E. This is linked to the wider Health Strategy for Birmingham, reducing burdens on existing healthcare facilities.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Kyle Stott / Josie Turner

Link to SDG's:

3. Ensure healthy lives and promote well-being for all at all ages

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

Whole Life Value Assessment

What are the cost implications of compliance? The cost of delivering healthcare facilities in Birmingham Smithfield and the potential for financial contributions from other sources needs to be considered to provide concrete commentary on the cost associated with this. It may be that in providing such facilities, the development reduces the level of Section 106 or Community Infrastructure Levy it may be required to contribute. This cannot be guaranteed and the design and location of such facilities may be dictated by the Local Authority. This will have a direct impact on the value associated with the facility.
What are the cost implications of moving beyond compliance? As above there will be an additional cost in providing these facilities. The extent of a healthcare centre and the potential for a range of care provision, including dental services, will dictate the size of the facility.
What is the value of moving beyond compliance? The ongoing maintenance and operation will have a significant cost, notably around maintenance and waste disposal. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for improved health care facilities will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

10.02 - Will the development result in improved leisure, recreation, sport and fitness facilities for the local area?	
The Big City Vision for Birmingham promotes active lifestyles and opportunities for recreation and leisure facilities. Providing leisure, recreation, sport and fitness facilities would enhance the user experience of Smithfield.	
Compliant / Standard Practice The development contributes towards the provision for leisure, recreation, sport and fitness needs for the future population either through the masterplan or by financial contributions to existing or proposed facilities.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Best Practice The potential for the masterplan to provide leisure, recreation, sport and fitness facilities has been fully explored and provision is made where appropriate. This should be considered in line with existing and proposed facilities in the area.	**Relevant Policy / Guidance** • http://www.birmingham.gov.uk/plan2031/evidencebase
Aspirational Not Set.	**Relevant Policy / Guidance**
Who is accountable for delivering this? • Kyle Stott / Josie Turner	
Link to SDG's: No direct links.	

Whole Life Value Assessment

What are the cost implications of compliance? Supporting leisure infrastructure represents a capital cost but that which may be considered essential in the delivery of the development. Where this was not planned to be included then this may represent an additional cost. The operation and maintenance of such facilities will represent an additional lifecycle cost to the site but offers a potential revenue stream for the development.
What are the cost implications of moving beyond compliance? Where the provision of leisure facilities is explored then the financial implication of providing them needs to be considered. Whether the development simply incorporates this space and engages a dedicated leisure provider to operate the facility, or whether they own and operate it themselves needs to be considered in light of the cost to fit out and operate the facility. It should be noted though that as there is an identified need then a gym represents a sustainable business on the site with a volume of potential customers from residents and workers on the site.
What is the value of moving beyond compliance? Provision of leisure facilities will support students and staff to lead healthy lifestyles and will contribute to a positive perception of the site where these facilities are usable and reliable. Their affordability will be a consideration in this. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for improved leisure, recreation, sport and fitness facilities will be predominantly social.

Whole Life Value		
Economic		
Social		
Environmental		

10.03 - How does the masterplan address air quality and support Birmingham's Clean Air Zone?

Poor air quality presents a risk to public health. In addition, the location of Smithfield within Central Birmingham presents localised air pollution issues. There should be a focus within the masterplan to minimise the generation of air pollution and mitigate against increased exposure to poor air quality.

Compliant / Standard Practice

A commitment has been made as part of the masterplanning process to create a Low Emission Strategy, incorporating an Air Quality Assessment and Air Quality Improvement Action Plan.

Through this assessment and in creating an Air Quality Strategy the masterplan seeks to reduce exposure to existing poor air quality.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Best Practice

Compliant / Standard Practice PLUS:

The masterplan seeks to reduce exposure to existing poor air quality.

Solutions for consideration include:

- Site layout
- Use of vegetation – e.g. green roofs, living walls, trees, landscaping.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

The developer has provided a commitment to the long term monitoring of local air quality with planned mitigation measures to reduce the impact of poor quality when specific air quality parameters are broken. This includes a commitment to assess interior air quality in buildings.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Mark Walstoncroft

Link to SDG's

3. Ensure healthy lives and promote well-being for all at all ages

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Whole Life Value Assessment

What are the cost implications of compliance? Engaging the technical skills required to deliver an Air Quality Strategy for the site will require additional funding in the design process. The outcome of this report may also require specific design measures to overcome poor local air quality. The cost of this is difficult to quantify without understanding the measures used to overcome the issue of poor air quality.
What are the cost implications of moving beyond compliance? As above where air quality needs to be addressed different measures, and the extent of these, will dictate the potential to increase cost. Where site layout is altered, there may be significant additional capital cost due to altering site layout / subterranean services. However, an integrated approach to air quality that also addresses issues of biodiversity value may mean investment in specific design solutions, such as green roofs and walls, represents significant value to the development.
What is the value of moving beyond compliance? Decreasing levels of pollution and increasing air quality will improve users' perception of the development. This also offers the opportunity to improve the health of development users by reducing their exposure to poor quality air. This has the potential to reduce illness and lost staff days. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance to address air quality will be predominantly social, economic.

Whole Life Value		
Economic		
Social		
Environmental		

10.04 - To what extent has the impact of noise been considered in the masterplan?

The design and layout of the masterplan can influence the extent to which noise will impact on the development. This in turn will have a bearing on the health and well-being of development users.

Compliant / Standard Practice

A Noise Impact Assessment will be completed as part of the masterplanning process to assess the impact of noise on the development.

Noise sensitive areas should be separated and protected from major sources of noise, to provide quiet spaces for both work and leisure.

(Please note: this should be conducted at an early stage to ensure design decisions can be made to reduce the impact of noise and also as part of a sustainable building assessment).

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Birmingham Noise Action Plan

Best Practice

The noise impact assessment has identified recommendations for addressing all identified noise issues within the site and on the site boundary with attenuation measures embedded within the masterplan to prevent disturbance to neighbouring noise sensitive areas.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Birmingham Noise Action Plan

Aspirational

A noise impact assessment is expanded to cover ALL construction activities to ensure they do not provide a disturbance to local communities.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase
- Birmingham Noise Action Plan **Error! Hyperlink reference not valid.**

Who is accountable for delivering this?

- Mark Walstoncroft

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? The capital cost of meeting compliance is directly related to the extent to which noise is an issue and the design solutions utilised to overcome this. A noise impact assessment will attract additional cost in design through engaging a specialist consultant. Where noise is an issue design solutions may be required. Typically speaking this may include higher specification facades that reduce internal noise levels or specific soft landscaping features / materials that absorb noise. The cost of these is difficult to summarise due to the high level of the masterplan and is highly dependent on the design response.

What are the cost implications of moving beyond compliance? Attenuating the impact of noise within the development is one issue, but addressing noise on site boundaries will incur additional capital cost. The North of the site is bounded by the A40, the East by a train line and the West by the Central Line. Along these site edges additional consideration will need to be given to public spaces and how 'user friendly' they are and the building uses of internal spaces closest to these sources of noise. As above, specific uses may require additional design measures to reduce the impact of noise on building users. Where this is the case there will be an additional capital cost but this may be a necessity for the development to be usable.

What is the value of moving beyond compliance? A reduction in noise and vibration disruption to building users (in the context of the major road and rail services in the vicinity) may represent a considerable lifetime benefit in terms of improved quality of internal spaces as well as the health, wellbeing and productivity of students, staff and other users. This will ensure internal space use is optimised and create a positive public opinion of the site and its functions. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for the impact of noise will be predominantly social and economic.

Whole Life Value		
Economic		
Social		
Environmental		

10.05 - Will lighting design reduce the impact that light pollution from the development has on surrounding communities?

Light pollution is excessive, misdirected, or obtrusive artificial light and can have a negative effect on the health and well-being of surrounding communities. Light pollution can be minimised through better lighting design and control.

Compliant / Standard Practice

The potential for light pollution has been considered through the lighting design of the development to minimise:

- Glare - the uncomfortable brightness of a light source when viewed against a dark sky;
- 'Light trespass' – the spread of light spillage beyond the boundary of the property on which a light is located; and
- 'Sky glow' - the orange glow we see around urban areas caused by a scattering of artificial light by dust particles and water droplets in the sky.

Relevant Policy / Guidance

http://www.birmingham.gov.uk/plan2031/evidencebase
Birmingham Lighting Strategy

Best Practice

Lighting Design is a specific element of the development design guide. This outlines how light pollution will be minimised with performance / energy specification criteria outlined demonstrating the low energy and limited lighting uplift of the installed lighting.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Aspirational

- There is a requirement for all commercial properties to limit night time lighting.
- 100% high efficiency lighting with limited upward light transmission will be installed for additional lighting.
- The final lighting design guide for the development outlines how light pollution will be minimised, and the specification of the lighting confirms (where possible) that lighting is low powered and designed / installed to reduce light pollution.

Relevant Policy / Guidance

- http://www.birmingham.gov.uk/plan2031/evidencebase

Who is accountable for delivering this?

- Jackie Homan.

Link to SDG's:

No direct links.

Whole Life Value Assessment

What are the cost implications of compliance? There is no significant additional capital cost to reducing light pollution. Slight alterations may be required to ensure this is minimised leading to slight alterations and material cost of specific fixtures and fittings. Where a specific lighting design expert is required there may be additional design costs incurred. Low energy fittings may be higher capital cost but should not represent any additional maintenance cost. Indeed, some fittings may be longer life than standard fixtures and fittings. Reducing light pollution through more direct lighting design may lead to operational cost saving where energy is not being wasted. Light fittings should ideally be specified in a standardised way to reduce cost and cost of replacement.
What are the cost implications of moving beyond compliance? There is no direct capital cost associated with the delivery of a Design Guide. Additional cost may be incurred in design through professional fees. In terms of capital cost lighting specifications / design should be considered more efficient but the operational savings this delivers are negligible.
What is the value of moving beyond compliance? There is no real 'direct cost' associated with moving beyond compliance. The value is determined by disruption to local areas due to light pollution. There may be lower operational cost where lighting is designed to be low energy and increasingly higher performance fixtures and fittings are being designed and available on the market. Internally buildings may reduce light 'spill' by introducing occupancy sensors and zonal controls. To support value the light fittings specified should be standardised and support ease of maintenance. It is considered that the whole life value benefit to Birmingham Smithfield for moving beyond compliance for reducing the impact of light pollution will be predominantly environmental and social.

Whole Life Value		
Economic		
Social		
Environmental		

Conclusions

This document sets out a range of sustainability issues, questions and key performance indicators designed to deliver a more sustainable development at Smithfield. This has been built on Birmingham's own policies and examples of Best Practice from ZEC stakeholders.

This framework should be considered in relation to the design of Smithfield. As such the focus is on embedding sustainability from the outset and not on reporting sustainability performance in use.

The framework, and supporting cost benefit analysis, are intended to guide discussions around what is deliverable at Smithfield. This has the potential to serve as a model for all future development in Birmingham.

About WBCSD

The World Business Council for Sustainable Development (WBCSD) is a global, CEO-led organization of over 200 leading businesses and partners working together to accelerate the transition to a sustainable world. We help make our member companies more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than $8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. WBCSD is uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability: united by our vision of a world where more than 9 billion people are all living well and within the boundaries of our planet, by 2050.

About UK BCSD

The UK Business Council for Sustainable Development (UK BCSD) is leading business in the transformation to profitable, sustainable growth. We demonstrate how the practical delivery of sustainable development creates outstanding opportunities for our members; and share best practice and valuable insight across our cross-sector network of leading organisations.

Our current priority themes are Creating Sustainable Places; Innovation for Climate Change Adaptation and Resilience and Designing new Business Models.

We are part of the WBCSD network of 65 branches, run member led Focus groups and support on priority themes, and a number of regional networks across the UK to work directly with devolved national governments, local government in England and regional economic structures and initiatives such as Local Enterprise Partnerships (LEPs), the Northern Powerhouse and Midlands Engine.

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