



ELEMENT
SUSTAINABILITY

CROWN STREET PHASE 2, MANCHESTER

ENVIRONMENT STANDARDS STATEMENT

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Charles Atkins Sustainability Consultant	Caroline Wills Director	Laurie Wills Director	

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ELEMENT
SUSTAINABILITY

phone: 01829 733 444

email: hello@elementsustainability.co.uk

www: www.elementsustainability.co.uk

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Appendix A - BREEAM Pre-Assessment
Appendix B - BRUKL Reports



1. INTRODUCTION

Element Sustainability has been commissioned by Renaker Build Limited to review the sustainability performance of the proposed primary school scheme at Crown Street.

The purpose of this statement is to summarise the relevant policy background and requirements of Manchester City Council (hereafter referred to as the council) and demonstrate the ways in which the developer, Renaker Build Limited, has addressed these aims through their proposals, ensuring all practicable measures have been taken in order to deliver a sustainable development at this site.

Details of the design attributes, specifications and characteristics of the scheme are appraised in order to demonstrate how the proposals contribute to sustainable development in Manchester and seek to mitigate the environmental impacts of the scheme, providing a sustainability appraisal in support of the planning application.



2. DEVELOPMENT PROPOSALS

2.1 Development Site Description

The application site is a brownfield plot and comprises an active compound for construction works on the adjacent residential developments. It is bound by Mancunian Way to the west and south, Crown Street to the East and Silvercroft Street to the North. Access is currently via either Silvercroft Street, which leads onto Great Jackson Street, or from the slip road off the A57 Mancunian Way, which subsequently leads onto Crown Street to the south.

Figure 2.1- Site Location Plan



2.2 Development Proposals

A hybrid application for Crown Street Phase 2 was approved under application 126668/FO2020 on 3rd August 2020. The hybrid permission provided outline consent, with all matters reserved, for Phase C (Building C3 – education facility / school) of the Crown Street Phase 2 development. This report has been prepared to support a reserved matters application for Phase C, the school.

The proposed C3 City Centre School (early years and primary school facility) at Crown Street, will be located adjacent to the Building C4 (The Blade). The proposed building will accommodate a nursery facility alongside primary school age teaching facilities with sports/multi-use hall, plant and welfare areas and rooftop play area.

No previous energy targets were established via the outline consent application; however these are addressed in Section 5 of this report.

Figures 2.2 to 2.7 present the plan and elevation drawings of the school building.



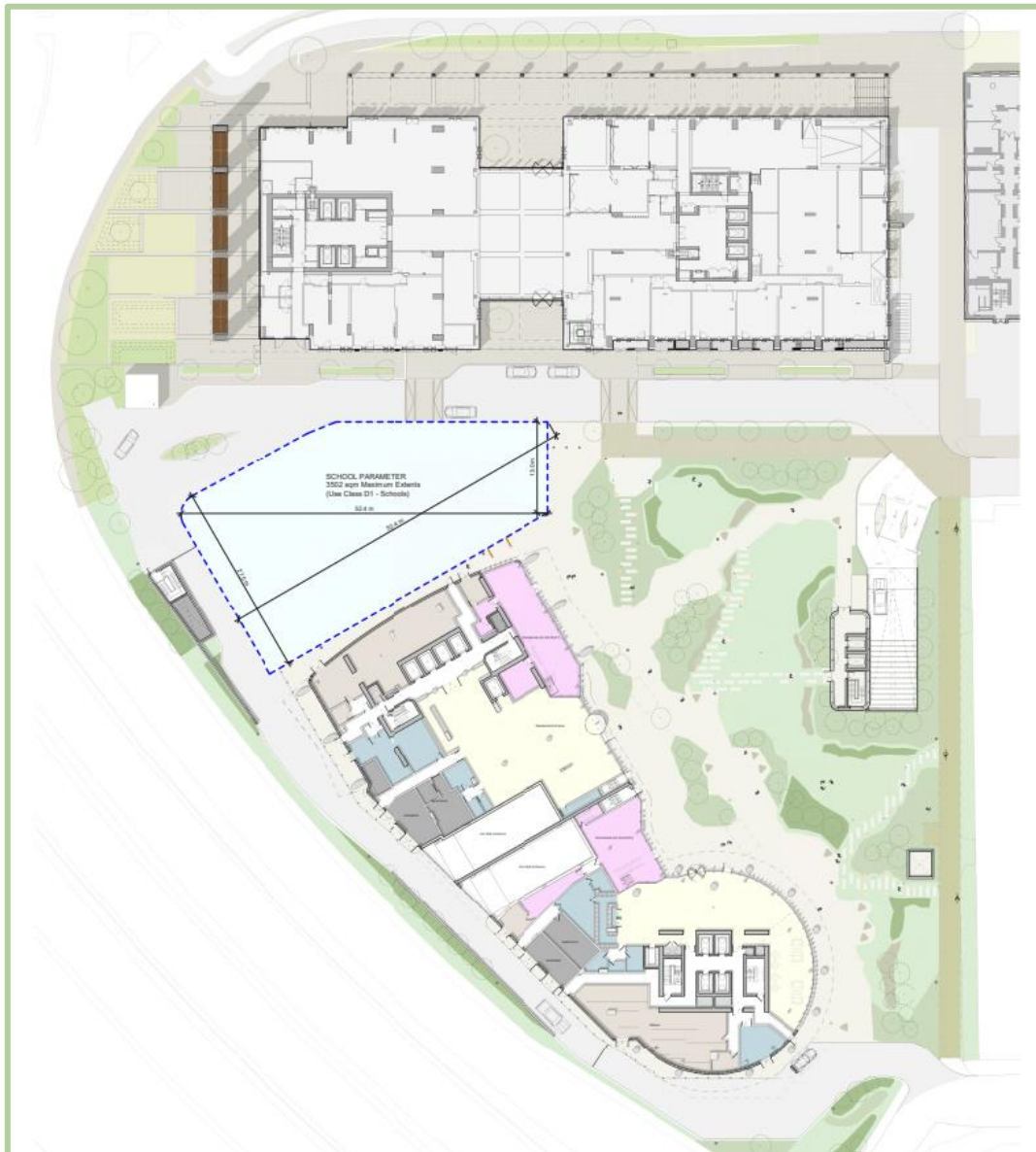
Figure 2.2 - School Parameter Plan

Figure 2.3 – Proposed Ground Floor Layout

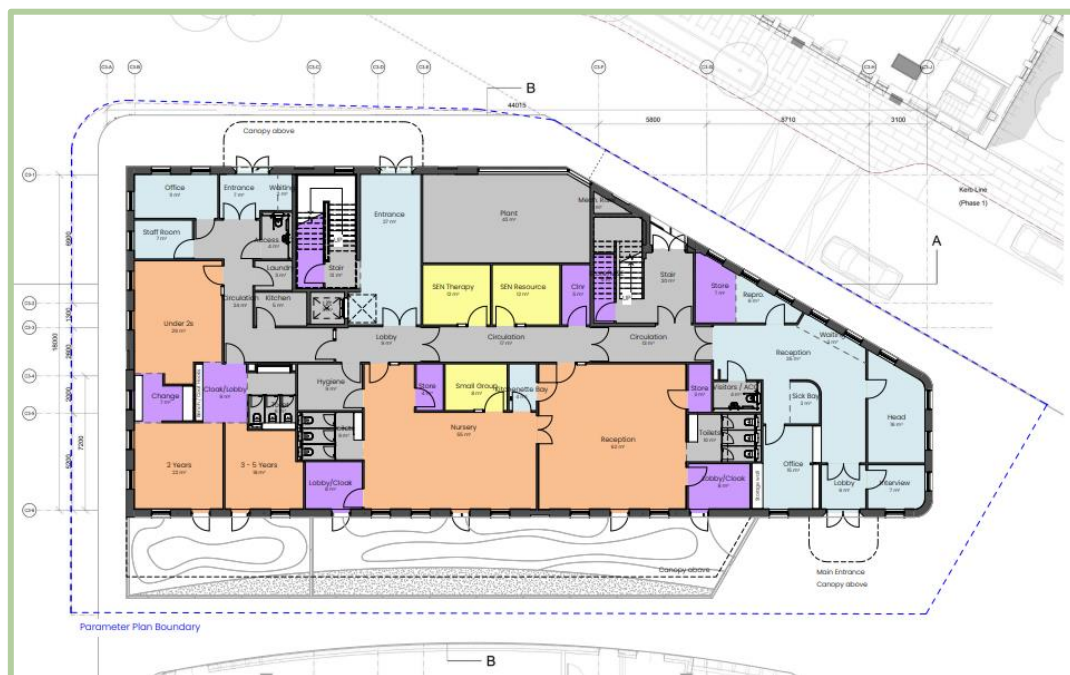


Figure 2.4 – Proposed First Floor Layout

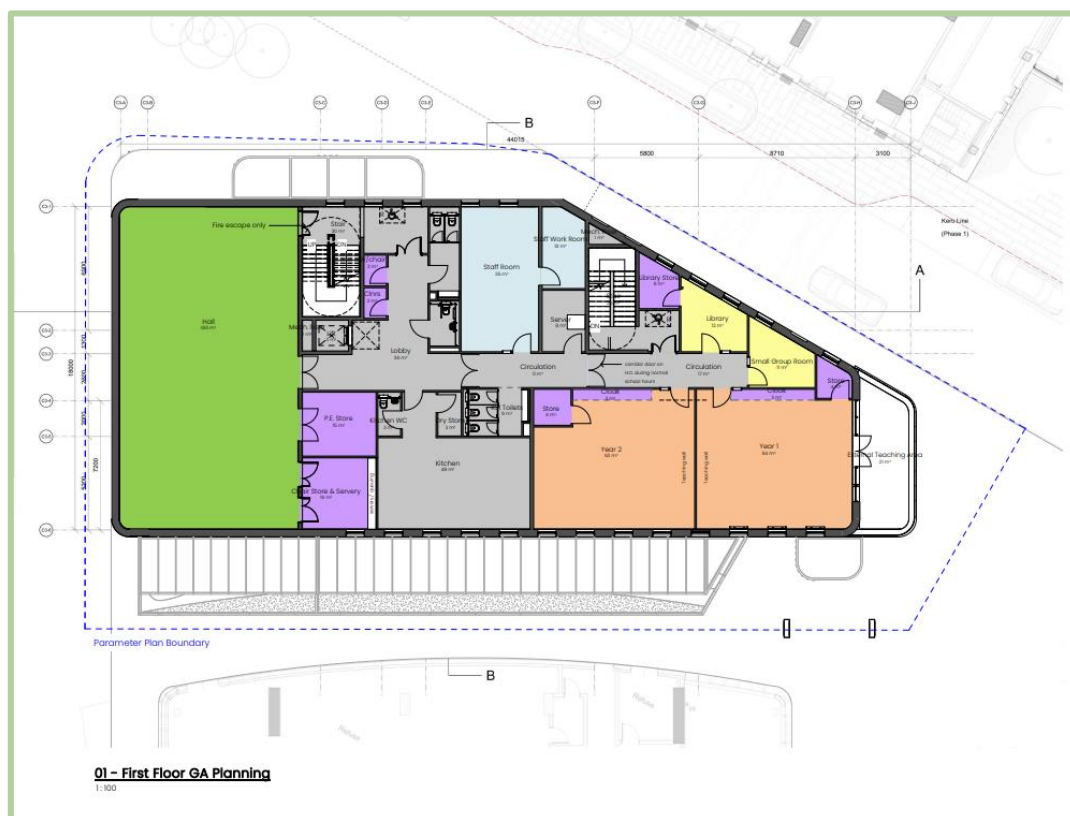


Figure 2.5 – Proposed Second Floor Layout



Figure 2.6 – Proposed Third Floor Layouts

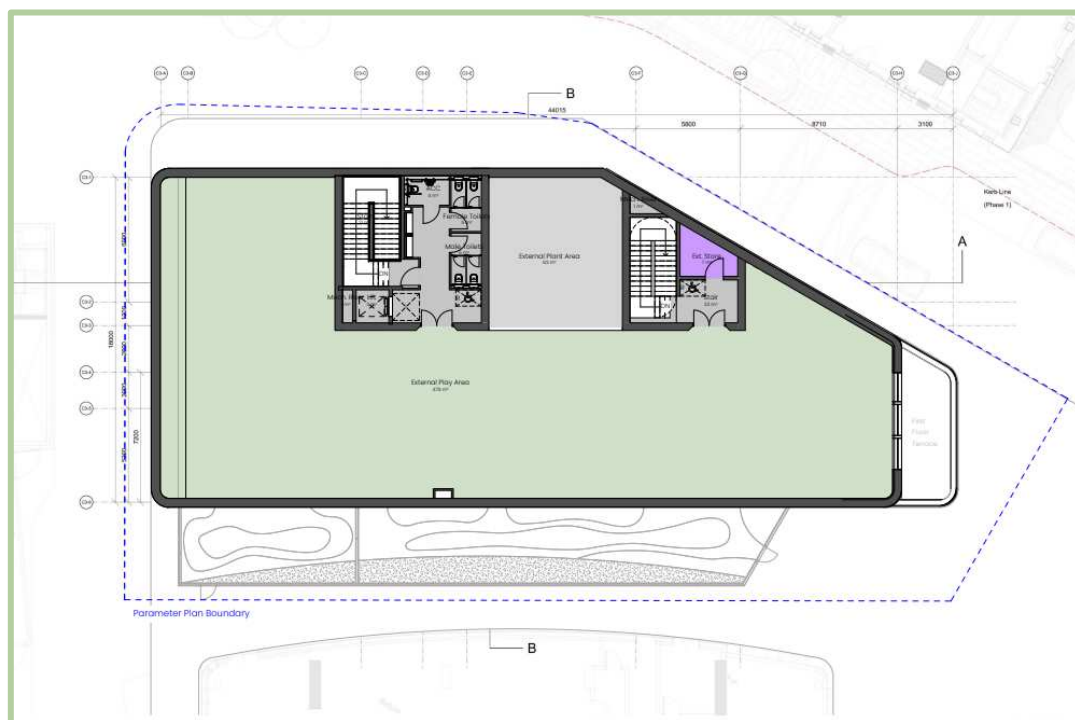


Figure 2.7 Proposed North and South Elevation Plan

3. POLICY REVIEW

3.1 National Planning Policy

The National Planning Policy Framework (NPPF) 2021 states that the planning system should play an active role in guiding development to sustainable solutions. At the heart of the 2021 updated NPPF lies the ‘presumption’ in favour of sustainable development; the golden thread running through plan-making and decision taking. There are three dimensions to sustainable development, as stated within the NPPF: economic, social, and environmental. These dimensions give rise to the need for the planning system to perform a number of roles:

An economic role – contributing to building a strong, responsive, and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;

A social role – supporting strong, vibrant, and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating beautiful and safe places, with accessible local services that reflect the community’s needs and support its health, social and cultural well-being; and

An environmental role – contributing to protecting and enhancing our natural, built, and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

These dimensions are considered to be mutually dependent with the NPPF, in its entirety, defining sustainable development. The NPPF states that ‘the purpose of the planning system is to contribute to the achievement of sustainable development’ (paragraph 7). It summarises the objective of sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their needs. It goes on to state that at a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being, and environmental protection.

3.2 Local Planning Policy

3.2.1 Manchester Core Strategy

Manchester's Core Strategy (CS) was adopted on 11th July 2012 and is the key Development Plan Document in the Local Development Framework (LDF).

CS Policy DM 1 - Development Management requires all development to have regard to a number of development principles. Subject to scheme viability, developers may be required to demonstrate that new non-domestic development to achieve a BREEAM Rating of ‘Very Good’.

CS Policy EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development requires all development to follow the principle of the Energy Hierarchy, being designed:

- To reduce the need for energy through design features that provide passive heating, natural lighting and cooling;



- To reduce the need for energy through energy efficient features such as improved insulation and glazing; and
- To meet residual energy requirements using low or zero carbon energy generating technologies.

CS Policy EN 5 - Strategic Areas for low and zero carbon decentralised energy infrastructure include:

- The Regional Centre, which also includes the Oxford Road Corridor and Eastlands;
- District Centres and associated major development sites;
- Airport Strategic Site;
- Strategic housing location; and,
- Strategic employment locations.

Within these areas new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans.

CS Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies requires applications for residential development of 10 or more units and all other development over 1,000m² to meet, as a minimum, the targets shown in the tables below, unless unviable.

Table 3.1 – Policy EN6 CO₂ Emissions Reduction Targets

Target	% Minimum Requirements
Target One: Network development area	CHP/District heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target Two: Electricity intense buildings	+15% increase on Part L 2010
Target Three: Micro generation area	+15% increase on Part L 2010

The Proposed Development falls under the Target 2 criteria and must comply with Part L (2013). The emission reductions targeted within policy EN6 relate to Building Regulation Part L 2010. As a consequence of the reduction in emission rates required by current building regulations (Part L, 2013) relative to Part L 2010, the revised equivalent target CO₂ emission reductions for the primary school scheme are presented below:

- *Non-domestic – 6% building emission rate reduction over Part L 2013.*

CS Policy EN 8 – Adaption to Climate Change requires all new development to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability;
- Reduction in urban heat island effect using Green Infrastructure such as green roofs, green walls, increased tree cover and waterways;
- The need to control overheating of buildings through passive design; and



- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.

CS Policy T 1 – Sustainable Transport aims to deliver a sustainable, high quality, integrated transport system to encourage modal shift away from car travel to public transport, cycling and walking, to support the needs of residents and businesses and to prepare for carbon free modes of transport, the Council will support proposals that:

- Improve choice by developing alternatives to the car;
- Promote regeneration and economic vitality by relieving traffic congestion and improving access to jobs and services, particularly for those most in need and for those without a car;
- Improve access to transport services and facilities to enable disabled people and people with mobility impairments to participate fully in public life;
- Improve pedestrian routes and the pedestrian environment;
- Improve and develop further Manchester's cycle network (for example the Manchester Cycleway and the Trans Pennine Trail); and
- Facilitate modes of transport that reduce carbon emissions e.g., by incorporating charging points for electric vehicles, subject to their appropriate design and location.

3.2.2 Guide to Development in Manchester, Supplementary Planning Document

Manchester's Core Strategy requires that all new residential developments should accord with the design guidance set out in the Supplementary Planning Documents (SPD). The Guide to Development in Manchester SPD was adopted on 11th April 2007 and supports and enhances the ongoing shaping of the City by providing a set of reasoned principles which will guide developers, designers and residents. These principles include a number of environmental standards, and includes the following categories which are identified in the SPD:

- | | |
|--|----------------------------|
| • Energy efficiency; | • Waste management; |
| • Renewable energy; | • Construction management; |
| • Environmental design; | • Biodiversity; and, |
| • Water management and weather resilience; | • Waterways. |

3.2.3 Manchester's Great Outdoors

A Green and Blue Infrastructure Strategy for Manchester aims to invest in the city's green and blue infrastructure over the next 10 years (by 2025). Four objectives have been established to enable the vision to be achieved:

1. Improve the quality and function of existing green and blue Infrastructure, to maximise the benefits it delivers.



2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth.
3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond.
4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy and the local environment.

3.2.4 Climate Emergency

On 10th July 2019, a motion asking MCC to formally declare a **climate emergency** was unanimously agreed. The motion declares that climate change is a serious risk to Manchester's future and committed to embedding the issue as an integral part of council decision-making – making sure that all key decisions are taken with the city's target of becoming zero-carbon by 2038 in mind. The council has agreed the following:

- To deliver the 2038 zero carbon target and determine if an earlier target can be possible;
- Encourage involvement in all wards by April 2020 through meetings as part of the Our Manchester strategy;
- Review all policies, processes and procedures to ensure the council can become carbon neutral. Present an action plan by March 2020 detailing how the city can stay within its carbon budget;
- Make climate breakdown and the environment an integral part of activity throughout the council, including all decision making, ensuring key decisions take into account the impact on achieving the zero-carbon target;
- Investigate measures to ensure future procurement is carbon neutral. Increase the percentage of social value with an additional environmental element;
- Work with suppliers to green their supply chains and support local production;
- Investigate and introduce measures to help reach domestic zero carbon levels including addressing fuel poverty and retrofitting existing homes; and
- Investigate ways to ensure that future local plans place a mandatory requirement for all new development to be net zero carbon by the earliest possible date.

In March 2020 the Executive adopted the Manchester Climate Change Framework 2020-2025. The five-year framework sets out measures that MCC will take in order to reduce carbon emissions from its buildings, energy use and transport. Measures include retrofitting buildings to improve energy efficiency, increasing the use of Electric Vehicle Vehicles, and seeking 100% renewable energy. Whilst this has also not been formally adopted into planning policy, it is a key consideration for future development proposals.

3.3 Emerging Policies

The Draft 'Places for Everyone' (PfE) Plan is a new long-term plan of nine Greater Manchester districts (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) for jobs, new homes, and sustainable growth. It has been prepared by the GMCA on behalf of the nine districts.



The Draft Plan will determine the kind of development that takes place across the city-region, maximising the use of brownfield land and urban spaces while protecting green belt land from the risk of unplanned development. It will also ensure all new developments are sustainably integrated into Greater Manchester's transport network or supported by new infrastructure.

The consultation for the PfE concluded in October 2021 and that it is now expected to progress to examination. It is therefore considered that the Plan is in an advanced stage of preparation.

3.4 Regulatory Framework

Building Regulations, Part L - Conservation of Fuel and Power sets the compliance standards for energy demand and carbon dioxide emissions from buildings. Guidance on how to meet the requirements of this regulation is provided within a number of approved documents. The relevant document is referenced below:

Approved Document L2A addresses the conservation of fuel and power in new non-domestic buildings. The proposed development will be registered against Building Regulations, Part L (2013) which requires all newly constructed buildings to comply with the 5 criteria set out in Approved Document L2A:

- I. Achievement of an acceptable Building CO₂ Emission Rate. i.e., the BER is less than the TER (target emission rate for a notional building);
- II. Limits on design flexibility – including U-values, air permeability, air handling plant efficiency, duct leakage, insulation, lighting system efficiency;
- III. Limiting solar gains in summer;
- IV. Construction quality and commissioning - The BER must be recalculated as constructed; and
- V. Provision of information - Information must be provided to the building operator.

3.4.1 Top 10 low carbon priorities checklist

In accordance with the MCC Design Principles, the following Top 10 Low Carbon Checklist shall be implemented as part of the design proposal:

1. Efficient Boilers
2. Improve Lighting
3. Improve ventilation
4. Reduce Water Consumption
5. Unregulated Energy Use Control
6. Upgrade Fabric Performance
7. Performance Measurement
8. Improve Insulation
9. Use Low Energy Equipment
10. Re-Use & Recycle

3.5 Applicable Targets

Based upon a review of relevant planning policy requirements, legislative drivers, and client priorities, the following list provides a brief precis of the key criteria that should be targeted for the school (Phase C):

- CS Policy DM 1 - Development Management;
- CS Policy EN 4 – Reducing CO₂ Emissions;



- Following the principles of the Energy Hierarchy to reducing CO₂ Emissions;
- CS Policy EN 5 - Strategic Areas for low and zero carbon decentralised energy infrastructure;
- CS Policy EN 6 – Target Framework For CO₂ Reductions From Low or Zero Carbon Energy Supplies;
 - Non-Domestic – 6% building emission rate reduction over Part L2A (2013)
- CS Policy EN 8 – Adaption to Climate Change;
- CS Policy T 1 – Sustainable Transport;
- The Guide to Development in Manchester SPD;
- A Green and Blue Infrastructure Strategy for Manchester;
- **Approved Document L2A (2013)** will guide the compliance standards for energy demand and carbon dioxide emissions from buildings to ensure compliance with CS Policy EN 6
- Top 10 Low Carbon Priorities Checklist



4. SUSTAINABILITY STATEMENT

This section provides an appraisal of the development proposals and details the specific approach, design features and specifications which will contribute to reducing the environmental impact of this scheme. This section outlines those commitments that have been made to ensure this scheme contributes to sustainable development and meets the Council's policy aims.

4.1 Energy Improvements

In order to limit energy demand and carbon dioxide (CO₂) emissions from the operation of the buildings, a number of design features will be integrated that will collectively contribute towards the emissions reduction target for the scheme.

Detailed measures are presented in Chapter 5 of this report, but in essence, the energy strategy focuses on a holistic and multi-faceted approach of improving the buildings' performance by applying a fabric-led approach and through improvements in the efficiency of the mechanical and electrical systems.

The building envelope incorporates energy efficient design and materials to exceed the thermal requirements of the current Building Regulations Part L by 5%.

The reduction in energy demand to meet the carbon reduction targets will be achieved through the following design measures and low carbon technology options:

- High performance thermal insulation
- Low air permeability
- Maximising solar control to mitigate overheating risks
- Air Source Heat Pumps
- Heat recovery ventilation systems (MVHR)
- High efficiency LED lighting

These measures will secure the following carbon reduction targets:

- ✓ Non-Domestic – 6 % improvement over Part L2A Building Regulations.
- ✓ At least 20% of final site energy demand to be met by on-site renewable energy technologies.

These reductions are in line with the requirements of the Manchester Core Strategy Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies and The CCP Top 10 low carbon checklist criteria

4.2 Water Conservation

The proposed development will be designed to reduce mains/potable water consumption and will include the following water efficient design and equipment:

- 'A' rated appliances will be used for dishwashers and washing machines (where provided) for their water saving capabilities;
- Specification of efficient water fixtures throughout the scheme (low flow taps and dual flush WCs); and,



- In order to reduce water demand, low volume / high efficiency sanitary fixtures will be specified to achieve a 50% reduction over the Building Research Establishment's baseline performance

4.3 Flood Risk Management

The Site is located within Flood Zone 1, and the probability of flooding is low, with a 1 in 1,000 annual probability of river flooding

- The Bridgewater canal is located approximately 280m to the north of the site; and according to the councils Level 2 SFRA Hydraulic Interactions map, the site will not be affected by flooding from this canal;
- The Environment Agency's Reservoir Flood map demonstrates that the site is not within an area that could be affected by flooding from reservoirs in the event of a reservoir failure
- The Environment Agency's Map of long-term flood risk from surface water, indicates that most of the site is at Very Low risk with a small portion of the site in Crown Street to be at Low risk of surface water flooding;
- The risk of sewer flooding is classed to be medium; and
- The risk of groundwater flooding is considered to be high.

The image below shows that the site is wholly located in Flood Zone 1, and therefore the risk of flooding from rivers is considered to be low.

Figure 4.1 EA Flood Zone Map



4.4 Waste Management

Construction Waste

Best practice techniques to prevent and minimise waste during the design and construction phases of the development will be adopted, as follows:

- A Site Waste Management Plan (SWMP) has been submitted and approved as part of the hybrid planning application for Crown Street Phase 2 (ref: 126668/FO/2020). This will be referred to prior to commencement of the construction phase, to limit the on and off-site environmental impacts of construction. The SWMP details:
 - Recycled and secondary materials;
 - Waste reduction;
 - Waste segregation;
 - Waste recovery; and,
 - Waste disposal.
- This scheme will promote the minimisation of waste arising in site development and seek to maximise the use of recycled materials in construction;
- A target of 90% of waste to be diverted away from landfill will be established for the construction phase of the development; and
- A site waste management plan will identify opportunities to minimise waste generation and divert construction waste from landfill.

Operational Waste

The operational waste strategy for the scheme focuses on the segregation of waste at source, in order to maximise the potential for employees and visitors to recycle. All members of staff and students will be provided guidance on recycling and health and safety practices related to the management and storage of waste.

The proposed strategy has been developed in compliance with the policies of Manchester City Council:

- Waste will be segregated at source with the help of segregated bins. It is expected that there will be multiple streams of waste – general, recyclables and compost / green waste;
- The school will be responsible for transferring the waste from the school refuse store to an open store for collection
- Following collection, the bins will be returned to the refuse store.

4.5 Materials

This development will contribute towards making more efficient use of non-renewable material resources and to reducing the lifecycle impact of materials used in construction. This is demonstrated by the selection of:

- Materials with low environmental impact throughout their lifecycle;



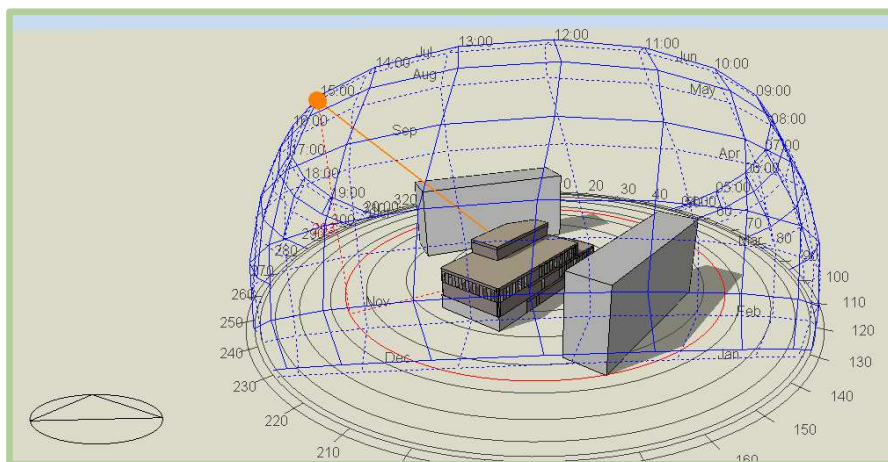
- Responsibly sourced materials from suppliers operating an Environmental Management System or procuring timber verified by either the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification standard (PEFC);
- Local sourcing of construction materials where feasible and viable, which will minimise the impact of carbon dioxide emissions associated with the transportation of materials;
- Material selection within the school will be carefully considered to avoid the use of toxic materials, such as Volatile Organic Compounds (VOCs) and contribute towards creating a healthy indoor environment.

4.6 Health and Wellbeing

To enable the occupants of the proposed development to lead lower impact lifestyles and enhance their quality of life, the following measures will be delivered:

- Good levels of natural day lighting will be achieved within the school. This will improve the occupant's comfort within the teaching facilities and reduce the need for energy to artificially light the building;
-
- Thermal comfort calculations (CIBSE TM52 – Limits of Thermal Comfort) demonstrate that the building is not deemed to be at risk from overheating;
-
- The Department for Education Annex 2 criteria for daylight provision within the relevant building zones will be achieved by the proposed design. This has been proven through the provision of building compliance modelling (see Figure 4.2); and,
- The very concept of the proposed school development will enhance the character of the area, as a familiar neighbourhood where people will live and spend their free time, supporting a vibrant, diverse and inclusive community

Figure 4.2 – 3D Rendering of the CCP School Building Compliance Model



4.7 Pollution Control

To reduce emissions of gases with high global warming potential (GWP) and nitrogen oxide (NOx) into the atmosphere, the building will be specified with:



- Insulating materials that have a GWP of less than 5 throughout the development to reduce the construction phase impact of this scheme upon climate change.
- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase;
- External light fittings will be controlled through a time switch, or daylight sensor, to prevent operation during daylight hours to limit the impact of artificial lighting on the surrounding environment;
- The 'full electric' energy strategy ensures there will be zero NOx emissions from the building; and,
- Dust suppression measures will also be put in place as part of the Main Contractor's Environmental Management Plan, such that any potential risks to watercourses or the neighbouring properties are minimised.

4.8 Ecology and Biodiversity

An Ecological Survey and assessment was submitted and approved as part of the hybrid planning permission for Crown Street Phase 2 (ref: 126668/FO/2020). The findings demonstrate that the site is of low ecological value and no invasive plant species were detected within the application site.

The treeline at the southern and western site boundaries are suitable for nesting birds, but apart from that no other protected species were detected. It is therefore recommended that any works which will disturb nesting birds are scheduled to commence outside the nesting season. If this is not feasible, then a Pre-work Nesting Bird Survey will be required.

It is also recommended that, where possible, ecological enhancements through appropriate landscape planting and habitat creation, should be considered to improve habitat connectivity and to achieve biodiversity gain across the site.

4.9 Transport

The proposed site has a high level of connectivity and benefits from access to a number of sustainable transport options. There are bus stops located within 400m walk of the site on Chester Road, providing frequent links between the city centre and Partington. Deansgate Rail Station and the tram stop, and Deansgate-Castlefield are both within a 500m walk of the site. Offering excellent links to the regional and national rail network. Supporting this is a good level of pedestrian and cycle infrastructure within the vicinity of the site, linking the surrounding area and public transport stops. Ensuring the feasibility of sustainable transport methods to and from the site.



5. ENERGY STRATEGY

5.1 Energy Strategy for Crown Street C3

In essence, the Energy Strategy for Phase C, focuses on a holistic and multi-faceted method of improving the building's performance by applying an enhanced fabric-led approach to limiting demand side energy loads, allied to improvements in the efficiency of the mechanical and electrical systems and the inclusion of renewable and low carbon energy technology.

The design measures outlined in the Energy Strategy comply with the policy requirements as set by the Manchester City Council's Core Strategy and the CPP Top 10 low carbon checklist criteria.

5.1.1 Build Fabric and Thermal Performance

The standard measurement of heat transfer through a given building material or construction type is the U-value ($\text{W/m}^2\text{K}$); the lower the U-value, the more slowly heat transfers and is lost out of a building.

In buildings, heat loss generally occurs through the following areas and elements of the construction:

- Ground Floor;
- External Walls;
- Roofs;
- Doors and Windows;
- Thermal (cold) Bridging; and,
- Uncontrolled Ventilation.

Table 5.1 presents the fabric parameters proposed for limiting heat loss and improving the building performance for the residential apartments.

Table 5.1 - Fabric Parameters

Construction Element	Proposed Fabric Specification
Ground Floor	$U=0.11 \text{ W/m}^2\text{K}$
External Wall	$U=0.21 \text{ W/m}^2\text{K}$
Roof	$U=0.22 \text{ W/m}^2\text{K}$
Windows	$U=1.40 \text{ W/m}^2\text{K}$, $g=0.40$
Air Permeability	Between 5.0 & $3.0 \text{ m}^3/\text{hm}^2$ (@50Pa.)

These specifications and design attributes will provide the following benefits:

- **High performance thermal insulation** throughout the building envelope (ensuring very low U-values for all heat loss elements) and thermally efficient windows and doors will minimise heat loss through the main building elements;
- **Thermally efficient, double-glazed windows** will be specified with argon gas fill and low emissivity coatings to limit heat loss through the panes.



- **G-values for the glazing will be specified to optimised** to balance beneficial solar gains but limit the propensity for the school to overheat;
- **Low air permeability** of between 5.0 & 3.0m³/hm² (@50Pa.) is targeted for this build in order to minimise uncontrolled ventilation. This will further reduce heat losses and provide high levels of occupant comfort (in combination with the proposed mechanical ventilation strategy). Focus on the quality of the build is vital to deliver such airtight buildings;
- **Attention to cold bridging junctions** including the provision of insulation to reduce heat and limit heat losses that occur at the junctions between building elements, around openings and will significantly improve the emission rate of the school; and

This specification will help to deliver an energy efficient development that achieves an emission rate reduction and fabric energy efficiency performance significantly beyond the requirements set by building regulation Part L (2013).

The proposed u values exceed the thermal requirements of building regs by at least 5% in accordance with the CCP Capital Programmes Top 10 Low Carbon Priorities criterion.

5.1.2 Building Services Specification

In addition to the improvements in the building fabric and thermal performance, a number of measures to improve the energy efficiency of the building systems have also been considered. The proposed mechanical and electrical specification that will be incorporated to ensure efficient servicing of the buildings is presented in Table 5.2.

Table 5.2 -Mechanical and Electrical Specification

Building Elements	Proposed Fabric Specification
Mechanical Ventilation	Monodraught “Hybrid Thermal Mixing” ventilation systems
Space Heating	Electric Panel Heaters – to sports hall
	Air Source Heat Pump - elsewhere
Water Heating	Air source heat pump, plus immersion and storage
Water Efficiency	High efficiency fixtures
Lighting	LED, 140L/cW

This mechanical and electrical specification will deliver a Building Regulation Part L2A (2013) compliant scheme and will provide the following benefits:

- **Hybrid Thermal Mixing (HTM®) systems** are designed to provide natural ventilation and hybrid ventilation incorporating mixed tempered air for winter periods, thereby reducing heating energy loads. In addition, the systems have the ability to provide secure night time cooling, and boosted levels of ventilation during summer. The HTM systems are designed to work in conjunction with natural ventilation and can be used in single sided or cross flow ventilation strategies.
- **The design air permeability of 3.0 – 5.0m³/hm² (@50Pa.)** for the school will virtually eliminate uncontrolled ventilation and ensure that the majority of the expelled stale air will pass across the heat exchanger, thereby boosting the energy reduction potential of these systems;



- **Air source heat pumps** will deliver space heating to the majority of operational zones within the building and generate the base hot water provision, feeding the central cylinder. The proposed heat pump system reduces energy demand and carbon dioxide emissions, as it offers an extremely efficient conversion rate of energy to heat. Efficient **electrical panel heating** will be specified for **for localised space heating within a number of secondary building zones**; and
- **LED lighting** (<140lm/cW) will be specified throughout the scheme to maximise operational efficiencies and lifespan of the fittings. LEDs operate with an estimated energy efficiency of up to 90% when compared to traditional lighting and conventional light bulbs. This means that about c.90% of the electrical energy is converted to light, rather than wasted heat as in conventional bulbs.

5.2 Energy Performance Calculations

In order to demonstrate the environmental benefits associated with the energy strategy for the school, representative Simplified Building Energy Models (indicative SBEM) have been completed at RIBA Workstage 2 using the Design Builder energy modelling software.

Table 5.3 below presents a summary of the calculations, which show the regulated energy demand and emission reductions achieved by the enhanced material specification and the specification of energy efficient systems for the school.

Table 5.3 – Energy Calculations

Representative Building	BER (kgCO ₂ /m ² /year)	TER (kgCO ₂ /m ² /year)	% Variance
School	10.8	14.3	-24.5

The calculations show that there is an expected improvement of between 24.5% over Part L2A of the Building Regulations (2013) for the school. Again, this is in compliance with the targets for non-domestic buildings as per the Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies of the Manchester Core Strategy and meet the objectives of the CCP Capital Programmes Top 10 Low Carbon Priorities.

5.2.1 Revised Carbon Factors

Building Regulation Part L (i.e. SAP10) will utilise revised carbon factors in the next planned update, currently under consultation. The current carbon factors applied in SAP 2012 for electricity are out of date, so these new factors better reflect the decarbonised status of the UK's electricity grid, as presented in Table 5.4.

Table 5.4 - Carbon Factors for Grid Electricity

Fuel	Software Version	Fuel Carbon Factor (kgCO ₂ /kWh)
Natural Gas	SAP 2012 (current)	0.216
	SAP 10 (revised)	0.210
Grid Electricity	SAP 2012 (current)	0.519
	SAP 10 (revised)	0.233



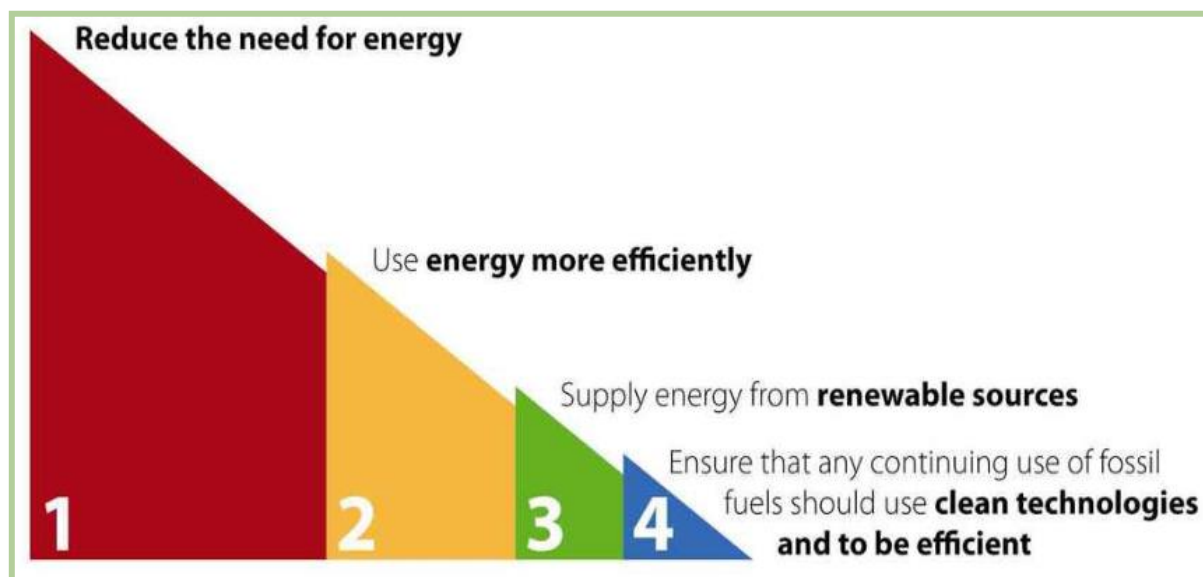
- Revised carbon factors to be applied in the forthcoming SAP 10 software are c.55% lower than the out-of-date factors currently being applied for building regulation compliance purposes.
- Grid mix electricity has now been calculated to be less than 10% more carbon intense than natural gas whereas the previous carbon factors show electricity to be more than twice as carbon intense as natural gas.

5.3 Energy Hierarchy

Crown Street Phase 2 Building C3 (education facility/ school) will incorporate a significantly enhanced material specification, along with high quality design and construction standards in order to improve the whole building energy efficiency through a 'fabric led' energy strategy. The proposed construction, design and specification will deliver a scheme that is inherently energy efficient during occupation.

The energy hierarchy provides a framework to guide energy policy and decision making to achieve practical and cost-effective carbon emission reductions. The hierarchy prioritises demand-side activities to reduce wastage and improve efficiency (see Figure 5.1).

Figure 5.1 – The Energy Hierarchy



First Principle:

The following efficiency measures are designed to reduce heat losses and minimise energy demand:

- The building will be constructed with high specification materials and design criteria which exceed current minimum Building Regulation standards and includes numerous efficiency measures designed to reduce heat losses and minimise energy demand.
- Heating systems will be provided with zonal, programmable thermostatic controls. Which will allow occupants to control zones within their units independently for maximum flexibility. This is intended to reduce the demand for additional energy usage.



Second Principle:

The approach taken for this Scheme will help to minimise energy demand and associated carbon dioxide emissions and is aligned with the second principle of the energy hierarchy, which states that reduction in energy demand should be achieved initially by energy efficiency.

To this effect, the following measures have been proposed:

- The design air permeability target for the buildings is between 3.0 – 5.0m³/hm² (@50Pa.). This low air permeability target will assist to limit the heat loss through the structure of the building;
- High efficiency air handling units with heat recovery capture 'waste' heat from the extracted stale air;
- The g value within the buildings will be optimised to control solar gain in the summer months and allow beneficial gains in the winter season to minimise the overheating risk and limit the heating energy demand within the units; and
- 100% LED provision and sophisticated control systems for the space within the buildings will also ensure the energy consumed is used efficiently.

Third Principle:

Renewable and low carbon technology including air source heat pumps will provide hot water within the school.

Fourth Principle:

The use of electric panels will ensure that fossil fuels converted and distributed through the National Grid as electrical energy for heating purposes will be consumed cleanly and efficiently.

Furthermore, as the UK electricity grids' CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme which benefits from a 'full electric' energy strategy.



6. BREEAM

BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for buildings.

BREEAM UK New Construction scheme is a performance based assessment method and certification scheme for new non-domestic buildings. The primary aim of BREEAM UK New Construction is to mitigate the life cycle impact of new buildings on the environment in a robust and cost effective manner. This is achieved through integration and the use of the scheme by clients and their project team at key stages in the design and construction process.

The building's performance is assessed under a number of categories, including:

- Energy;
- Water;
- Transport;
- Materials;
- Land Use;
- Pollution;
- Health and wellbeing; and
- Management.

The BREEAM rating benchmarks for BREEAM UK new construction projects assessed using the 2018 version of BREEAM are presented in Table 6.1 below.

Table 6.1 – BREEAM Rating Benchmarks

BREEAM Rating	% Score Required
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30

There are minimum standards associated with the BREEAM 'Very Good' standard in terms of the building's energy and emission performance. However, to ensure that performance against fundamental environmental issues is not over-looked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas e.g. energy, water, materials etc.

A BREEAM 'Very Good' rating requires the following minimum performance standards, see Table 6.2.



Table 6.2 – Mandatory ‘Very Good’ Standards – Fully Fitted

<i>BREEAM NC 2018 Issues</i>	<i>Minimum Standards for BREEAM for 'Very Good' rating</i>
<i>MAN 4: Commissioning and Handover</i>	<i>One credit (commissioning-test schedule and responsibilities)</i>
<i>MAN 4: Commissioning and Handover</i>	<i>Criterion 11 (Building User Guide)</i>
<i>ENE 2: Energy Monitoring</i>	<i>One credit (First sub metering credit)</i>
<i>WAT 1: Water Consumption</i>	<i>One credit</i>
<i>WAT 2: Water Monitoring</i>	<i>Criterion 1 only</i>
<i>MAT 3: Responsible Sourcing of Materials</i>	<i>Criterion 1 only</i>

6.1 Potential BREEAM Rating

BREEAM UK 2018 Non-Domestic New Construction (Public, Education, Schools) – Fully Fitted pre-assessment has been prepared by a qualified, licensed BREEAM Assessor. This determines the feasible credits and potential BREEAM rating for the Crown Street Primary School and demonstrates a commitment to the principles of good construction, design and sustainability.

BREEAM Score and Rating – ‘Very Good’

Working alongside the qualified BREEAM assessor, the technical design team has reviewed the individual credit criteria and award of credits within the Pre-Assessment in order to optimise the building’s BREEAM performance. All credits allocated within this BREEAM Pre-Assessment will require further technical verification and additional feasibility assessment during the formal Design Stage and Post Construction BREEAM assessment.

The BREEAM Pre-Assessment (presented in the Appendix of this Statement) show that the building is expected to perform as follows:

- Indicative building BREEAM score = **59.80%** (*minimum required for BREEAM ‘Very Good’ = 55%*)
- Indicative BREEAM rating = Potential for **BREEAM ‘Very Good’ rating**.

Following an initial review of the proposals the BREEAM New Construction pre-assessment report demonstrates that the proposed development is able, in principle, to meet all mandatory credit requirements and achieve an overall BREEAM ‘Very Good’ rating for all retail units.

Details of the pre-assessments can be found in the appendix of this report.

Note that a number of assumptions have been made within this initial appraisal which will require confirmation by means of further technical input during the formal assessment, once the design and specifications are finalised. The approach to achieving the target BREEAM rating may therefore, be subject to change further into the development cycle.



7. CONCLUSION

This Statement has reviewed the sustainability performance of the Phase 3 C3 City Centre School as part of the Crown Street Development against national and local planning policies. The conclusion that may be drawn from the process is as per the following:

Sustainability Performance –

- Water consumption of the development will be minimised through **the specification of efficient water fixtures**.
- The proposed scheme location promotes access **to sustainable transport options** and the design has prioritised pedestrians and cyclists over the private car. Provision of cycle storage and access to regular busses will contribute towards creating a highly connected and sustainable development.
- The development Site is located within Flood Risk Zone 1. Post development surface water run-off rates will be **managed and mitigated through the implementation of SUDs** where applicable.
- Waste arising during construction and occupation/operation will be minimised through the **implementation of a Waste Management Plan (CEMP)**. The WMP will be used to ensure that there is adequate management and storage of construction waste takes place in line with the Council's policies. Opportunities for the possible recycling of construction from excavation works will also be considered in line with best practice.
- **A refuse management strategy** has been developed to manage waste and recyclables from the operational phase of the development. Source segregation and the provision of refuse areas will encourage individuals to recycle and **divert waste away from landfills**.
- Materials are proposed to be **responsibly sourced and materials with low environmental impact** will be selected and local suppliers will be prioritised. Material selection will be carefully considered to avoid the use of toxic materials and materials with VOCs.
- The findings from the Ecological Survey shows that there are **no legally protected and / or notable species and their habitats on site**.
- The BREEAM Pre-Assessment shows that the building is expected to achieve an indicative **BREEAM rating of 'Very Good'**.
- The relevant building areas meet **good practice daylight factors**

Energy Strategy –

The development will be designed and specified in accordance with **the principles of the energy hierarchy** and in line with the **targets and guidance set out in Manchester City Council's Core Strategy**.

- A combination of **enhanced building fabric** (significantly beyond the regulatory compliance standard), efficient mechanical and electrical systems, and controls, will achieve compliance with the emission reduction targets stipulated by Building Regulations Part L2A (2013).



- The school also benefits from **air source heat pumps** specified to meet the hot water requirements. These systems are extremely energy efficient and will play a significant role in reducing the development's carbon footprint;
- High efficiency HTM ventilation system
- Energy modelling calculates a minimum **24.5% emissions reductions** over Part L2A (2013) of the Building Regulations and will aim for 20% renewable energy provision on site.

The proposals reviewed within this statement for the primary school scheme at Crown Street in Manchester will deliver a highly energy efficient and sustainable scheme, providing a quality development that accords with the guidance provided within the Manchester City Council' adopted planning policies. The scheme is wholly aligned with the specific requirements of the Department for Education and also Manchester City Council 'CCP Capital Programmes Top 10 Low Carbon Priorities'.



Appendix A – BREEAM Pre-Assessment



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New Construction 2018 - BREEAM Pre-Assessment Review

Overview Potential Target BREEAM Rating

Indicative BREEAM Pre-Assessment score = **59.80% (minimum required = 55% for BREEAM Very Good)**

An initial BREEAM New Construction 2018 Pre-Assessment has been prepared by a qualified and licensed BREEAM Accredited Professional and Assessor. This Pre-Assessment demonstrates that the new development, in principle, can meet all mandatory credit requirements and will aim to achieve an overall BREEAM 'Very Good' rating.

Working alongside the qualified BREEAM assessor, the technical design team has reviewed the individual credit criteria and award of credits within the Pre-Assessments in order to optimise the building's BREEAM performance. All credits allocated within this BREEAM Pre-Assessments will require further technical verification and additional feasibility assessment during the formal Design Stage and Post Construction BREEAM assessments.

Note that a number of assumptions have been made within this initial appraisal process which will require confirmation by means of further technical input during the formal assessment, once the design and specifications are finalised. The approach to achieving the target BREEAM rating may, therefore, be subject to change further into the development cycle.

Minimum Standards

The minimum standards for the BREEAM 'Very Good' rating are provided below (Table 1.1). To achieve a particular level of performance the majority of BREEAM credits can be traded, i.e. non-compliance in one area can be off set through compliance in another to achieve the target BREEAM rating.

To ensure that performance against fundamental environmental issues is not overlooked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas.

Table 1.1 - Minimum Standards

BREEAM NC 2018 Issues	Minimum Standards for BREEAM for 'Very Good' rating
ENE 2: Energy Monitoring	One credit (First sub metering credit)
MAN 4: Commissioning Handover	One credit (commissioning-test schedule and responsibilities)
MAN 4: Commissioning Handover	Criterion 11 (Building User Guide)
WAT 1: Water Consumption	One credit
WAT 2: Water Monitoring	Criterion 1 only
MAT 3: Responsible Sourcing of Materials	Criterion 1 only

There are a number of BREEAM credits that need to be addressed at particular RIBA Stage. These credits have been highlighted in **Yellow** within Table 1.2 below



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Issue	Available Credits	Targeted Credits	Responsibility	BREEAM Criteria
Management				
Man 1 – Project Brief and Design				
Man 1a	Stakeholder Consultation (Project Delivery)	1	1	Design Team
BREEAM Criteria: A clear sustainability brief is developed prior to Concept Design AND prior to completion of the Concept Design (RIBA Stage 2 or equivalent), the project delivery stakeholders (see Relevant definitions) have met to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery. The project team demonstrate how the project delivery stakeholder contributions and the outcomes of the consultation process have influenced or changed the Initial Project Brief, including if appropriate, the Project Execution Plan, Communication Strategy, and the Concept Design.				
Man 2b	Stakeholder Consultation (Third Party)	1	1	Design Team
BREEAM Criteria: Prior to completion of the Concept Design, the design team consult with all interested parties on matters that cover the minimum consultation content. Demonstrate how the stakeholder contributions and consultation exercise outcomes influence the Initial Project Brief and Concept Design. Prior to completion of the detailed design (RIBA Stage 4, Technical Design or equivalent), all interested parties give and receive consultation feedback. EDUCATION SPECIFIC REQUIREMENTS: An independent party carries out the consultation exercise. The Design Quality Indicator (DQI) and the Achieving Excellence Design Evaluation Toolkit (AEDET) could be used as methods to assess the design quality of buildings.				
Man 2c	BREEAM AP (Concept Design)	1	0	BREEAM AP
Credit Not Sought BREEAM Criteria: Involve a BREEAM AP in the project at an appropriate time and level to: a. Work with the project team, including the client, to consider the links between BREEAM issues and assist them in maximising the project's overall performance against BREEAM, from their appointment and throughout Concept Design. b. Monitor progress against the performance targets agreed throughout all stages after their appointment, where decisions critically impact BREEAM performance. c. Proactively identify risks and opportunities related to the achievement of the targets agreed.				



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					d. Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.
Man 1d	BREEAM AP (Developed Design)	1	0	BREEAM AP	Credit Not Sought <u>BREEAM Criteria</u> Involve the BREEAM AP in the project at an appropriate time and level to: a. Work with the project team, including the client, to consider the links between BREEAM issues and to assist them in maximising the project's overall performance against BREEAM throughout Developed Design. b. Monitor progress against the performance targets agreed throughout all stages where decisions critically impact the specification and tendering process and the BREEAM performance. c. Proactively identify risks and opportunities related to the achievement of the targets agreed. d. Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.
Man 2 - Life Cycle Cost and Service Life Planning					
Man 2a	Elemental LCC	2	0	Cost Consultant	Credit Not Sought <u>BREEAM Criteria</u> A competent person (see Definitions on the facing page) carries out an outline, entire asset LCC plan at Process Stage 2 (equivalent to Concept Design - RIBA Stage 2) together with any design options appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865: 2008. The elemental LCC plan: a. Provides an indication of future replacement costs over a period of analysis as required by the client (e.g. 20, 30, 50 or 60 years); b. Includes service life, maintenance and operation cost estimates. The study period should ideally be agreed by the client, in line with the design life expectancy of the building. However, where the life expectancy of the building is not yet formally agreed (due to being at very early design stages), the default design life of 60 years should be used for modelling purposes (in line with the UK default). Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.



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Man 2b	Component LCC	1	0	Cost Consultant	Credit Not Sought <u>BREEAM Criteria</u> A competent person develops a component level LCC options appraisal by the end of Process Stage 4 (equivalent to Technical Design – RIBA Stage 4) in line with PD 156865: 2008. The component level LCC includes (where present): a. Envelope, e.g. cladding, windows, or roofing b. Services, e.g. heat source, cooling source, or controls c. Finishes, e.g. walls, floors or ceilings d. External spaces, e.g. alternative hard landscaping, boundary protection. The Component level LCC option appraisal should review all of the above component types (where present). However, you do not need to consider every single example cited under each component; only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components which would benefit the most from appraisal. Demonstrate, using appropriate examples provided by the design team, how the component level LCC options appraisal has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.
Man 2c	Capital Cost Reporting	1	1	Client or Project Manager	The capital cost to be reported for the project £/m ² .
Man 3 - Responsible Construction Practices					
Man 3	Timber Procurement (M)	Pre-Req	Pre-Req	Main Contractor	Main contractor to ensure that all timber is legally harvested and trade timber.
Man 3a	Environmental Management	1	0	Main Contractor	Credit Not Sought <u>BREEAM Criteria</u> Main Contractor to operates ISO 14001.



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Man 3b	Sustainability Champion	1	1	Sustainability Champion	Involve a BREEAM AP in the project at an appropriate time and level to: a. Work with the project team, including the client, to consider the links between BREEAM issues and assist them in achieving and if possible, going beyond the design intent, to maximise the project's performance against the agreed performance targets throughout the Construction, Handover and Close Out stages. b. Monitor construction progress against the performance targets agreed under criterion 5 above throughout all stages where decisions critically impact BREEAM performance. c. Proactively identify risks and opportunities related to the procurement and construction process and the achievement of the targets agreed under criterion 5 above. d. Provide feedback to the constructors and the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. e. Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team and the provision to the assessor.
Man 3c	Responsible Construction Management	2	0	Main Contractor	Credit Not Sought <u>BREEAM Criteria</u> The Main Contractor to register with CCS and achieve a score of beyond compliance and achieve the remaining items listed on Table 4.1 of the NC 2018 Technical Manual.
Man 3d	Monitoring of Construction site impacts (Energy and Water)	1	1	Main Contractor	<u>BREEAM Criteria</u> Main Contractor sets targets, monitors and reports on energy and water consumption each month, based on site activities.
Man 3e	Monitoring of Construction Site Impacts (Transport)	1	1	Main Contractor	<u>BREEAM Criteria</u> Main Contractor monitors transport of materials from the factory gate to the building site, including any transport, intermediate storage and distribution; as well as transport of construction waste from the construction gate to waste disposal processing/recovery centre gate.



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Man 4 - Commissioning and Handover					
Man 4a (MINIMUM STANDARD)	Commissioning and Testing Schedule and Responsibilities	1	1	Client/ M&E	<u>BREEAM Criteria</u> There is a schedule of commissioning and testing that identifies appropriate commissioning required for the scope of works that includes a suitable timescale for commissioning and re-commissioning of all relevant works carried out.
Man 4b	Commissioning Building Services	1	1	M&E	<u>BREEAM Criteria</u> Where work is being undertaken to upgrade, renovate or install new building services and systems. a. For complex building services and systems, a specialist commissioning manager is appointed during the design stage (by either client or contractor) with responsibility for: i. Undertaking design reviews and giving advice on suitability for ease of commissioning ii. Providing commissioning management input to construction programming and during installation stages iii. Management of commissioning, performance testing and handover/post handover stages.
Man 4c	Testing and Inspecting Building Fabric	1	1	Main Contractor	<u>BREEAM Criteria</u> Projects where the fabric of the building is being upgraded, the integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths is quality assured through completion of a thermographic survey as well as airtightness testing and visual inspection at appropriate times during the construction. The survey/testing is undertaken by a Suitably Qualified Professional.
Man 4d (MINIMUM STANDARD)	Handover	1	1	Design Team	<u>BREEAM Criteria</u> Prior to handover, develop two building user guides for the following users: - a: A non-technical user guide for distribution to the building occupiers. - b: A technical user guide for the premises facilities managers. Draft copies will be developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users. Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users: - a: A non-technical training schedule for the building occupiers. - b: A technical training schedule for the premises facilities managers.



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Man 5 – Aftercare					
Man 5a	Aftercare Support	1	1	Developer	<u>BREEAM Criteria</u> Provide aftercare support to the building occupiers through having in place operational infrastructure and resources. This includes as a minimum: • A meeting between the aftercare support team or individual, and the building occupier or management team (prior to initial occupation, or as soon as possible thereafter) to: • Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule. • Present key information about features of the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible. • On-site facilities management training including: • A walkabout of the building AND • introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands. • Provide initial aftercare support for at least the first month of building occupation, e.g. weekly attendance on-site, to support building users and management (the level of frequency will depend on the complexity of the building and building operations). • Provide longer term aftercare support for occupiers for at least the first 12 months from occupation, e.g. a helpline, nominated individual or other appropriate system to support building users and management. Establish operational infrastructure and resources to coordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is substantially occupied. This facilitates analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and user behaviours accordingly.



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Man 5b	Seasonal Commissioning	1	1	M&E	<u>BREEAM Criteria</u> Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied: Complex systems: The specialist commissioning manager will: - i Identify changes made by the owner or operator that might have caused impaired or improved performance. - Test all building services under full load conditions, i.e. heating equipment in mid-winter, cooling and ventilation equipment in mid-summer and under part load conditions (spring and autumn). - iii Where applicable, carry out testing during periods of extreme (high or low) occupancy. - iv Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems. - v Produce monthly reports comparing sub-metered energy performance to the predicted one. - vi Identify inefficiencies and areas in need of improvement. - vii Re-commission systems (following any work needed to serve revised loads) and incorporate any revisions in operating procedures into the operations and maintenance (O&M) manuals.
Man 5c	Post Occupancy Evaluation	1	0	End Occupier	Credit Not Sought <u>BREEAM Criteria</u> The client or building occupier commits to carry out a POE exercise (see Definitions on the facing page) one year after the building is substantially occupied. This gains comprehensive in-use performance feedback identifies gaps between design intent and in-use performance. The aim is to highlight any improvements or interventions that need to be made and to inform operational processes. An independent party carries out the POE covering: - a A review of the design intent and construction process (review of design, procurement, construction and handover processes). - b Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering: - i Internal environmental conditions (light, noise, temperature, air quality) - ii Control, operation and maintenance - iii Facilities and amenities - iv Access and layout - v Energy and water consumption - vi Other relevant issues, where appropriate



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					The independent party provides a report with lessons learned to the client and building occupiers. <u>BREEAM Criteria</u> The client or building occupier commits funds to pay for the POE in advance. This requires an independent party to be appointed to carry out the POE. Evidence of the appointment of the independent party and schedule of responsibilities which fulfils the BREEAM criteria are acceptable to demonstrate compliance.
Health and Wellbeing					
Hea 1 - Visual Comfort					
Hea 1a	Glare Control	1	1	Architect	<u>BREEAM Criteria</u> Identify areas at risk of glare using a glare control assessment. The glare control assessment also justifies any areas deemed not at risk of glare. Where risk has been identified within a relevant building area, a glare control strategy issued to design out the potential for glare. The glare control strategy does not increase energy consumption used for lighting. This is achieved by: - a Maximising daylight levels in all weather, cloudy or sunny AND - b Ensuring the use or location of shading does not conflict with the operation of lighting control systems. EDUCATION SPECIFIC REQUIREMENTS - Definition: Glare control - relevant building areas Education For glare control include areas of the building where lighting and resultant glare could be problematic for users, e.g. those areas that have been designed to contain or use workstations, projector screens etc. and sports halls.



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Hea 1b	Daylighting	2	2	Daylight Consultant	<u>BREEAM Criteria</u> Daylighting criteria have been met using either of the following options: a. The relevant building areas meet good practice daylight factors and other criteria as outlined in Table 5.1 of the NC 2018 Technical Manual. and Table 5.2 of NC 2018 Technical Manual OR b. The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table 5.3 of NC 2018 Technical Manual. EDUCATION SPECIFIC REQUIREMENTS: The daylighting criteria to be achieved would be as follows: Preschools, schools, further education occupied spaces = 2% average daylight factor 80% Minimum area (m2) to comply Definition: Daylighting - relevant building areas For the purpose of BREEAM, this is defined as areas within the building where good daylighting is considered to be of benefit to the building users (typically those areas occupied continuously for 30 minutes or more). This includes the following (where occupied continuously for 30 minutes or more) specifically stated because they are often omitted: 1. Sports hall exercise spaces 1. 4. Kitchen and catering areas 2. 5. General communal areas 3. 6. Small offices (including those within multi-residential buildings) 4. 7. Meeting rooms (including those within multi-residential buildings) 5. 8. Leisure areas 6. 9. Any area that may involve close up work. However, this excludes the following (where present): Media, arts production, SEN sensory spaces, and other areas requiring strictly controlled acoustic or lighting conditions.
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Hea 1c	View Out	1	1	Architect	95% of the floor area in 95% of spaces for each relevant building area provides an adequate view out. Definition/Applicable Rooms: <i>'BREEAM defines an adequate view out as being at seated eye level (1.2 – 1.3m) within the relevant building areas. However, where occupants will not have the option to be seated, for example in some industrial operational areas where the work being undertaken requires occupants to remain standing, the height of the view out can be changed accordingly to suit the eye level of occupants.'</i>
Hea 1d	Internal and External Lighting	1	1	M&E	<u>BREEAM Criteria</u> Internal Lighting – Internal lighting in all relevant areas of the building is designed to provide illuminance (lux) levels and colouring rendering index in accordance with the SLL Code for Lighting 2012 and any other relevant industry standard. Internal lighting should be appropriate to the tasks undertaken, accounting for building user concentration and comfort levels. For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7 sections 2.4, 2.13 to 2.15, 2.20, and 6.10 to 6.20. This gives recommendations highlighting: a. Limits to the luminance of the luminaires to avoid screen reflections. b. Any area where a surface is used to reflect light into a space, such as uplighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this. c. Recommendations for direct lighting, ceiling illuminance, and average wall illuminance. Zoning and Controls – Internal lighting is zoned to allow for occupant control. Zoning is in accordance with the criteria below for relevant areas present within the building: - In office areas, zones of no more than four workplaces - Workstations adjacent to windows or atria and other building areas separately zoned and controlled - Seminar and lecture rooms: zoned for presentation and audience areas - Library spaces: separate zoning of stacks, reading and counter areas - Teaching space or demonstration area - Whiteboard or display screen - Auditoria: zoning of seating areas, circulation space and lectern area - Dining, restaurant, café areas: separate zoning of servery and seating or dining areas



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					<u>Exclusions</u> from zoning and controls - The following internal areas are excluded from the lighting zone requirements: - Media and arts production spaces - Sports facilities (exercise spaces only, including hydrotherapy and physiotherapy areas). EDUCATION SPECIFIC REQUIREMENTS: Manual lighting controls are easily accessible for the teacher while teaching and on entering or leaving the teaching space. Manual lighting controls need only be provided for staff, not the children. External Lighting – All external lighting located within the construction zone is designed in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas3 and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places.
Hea 2 Indoor Air Quality					
Hea 2a	Pre-requisite - Indoor Air Quality Plan	Pre-req	Pre-req	Design Team/ Indoor Air Quality Specialist	<u>BREEAM Criteria</u> A site-specific indoor air quality plan has been produced and implemented in accordance with the guidance in Guidance Note GN06. The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following: 1.a Removal of contaminant sources 1.b Dilution and control of contaminant sources: 1.b.i Where present, consideration is given to the air quality requirements of specialist areas such as laboratories 1.c Procedures for pre-occupancy flush out 1.d Third party testing and analysis 1.e Maintaining good indoor air quality in-use.
Hea 2b	Ventilation	1	0	M&E	Credit Not Sought



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Hea 2c	Volatile Organic Compounds (VOCs)	2	1	Design Team and Main Contractor	<u>BREEAM Criteria</u> One credit Three out of the five product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM Technical Manual. Where wood-based products are not one of three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum. Two Credits All the product types listed meet the emission limits, testing requirements and any additional requirements listed in Table 5.11 of the BREEAM Technical Manual.
Hea 2d	Volatile Organic Compound (VOC) Emission Levels (Post Construction)	1	0	Main Contractor/ Indoor Air Quality Specialist	Credit Not Sought <u>BREEAM Criteria</u> The formaldehyde concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 100µg/m³ averaged over 30 minutes (World Health Organization guidelines for indoor air quality: Selected pollutants, 2010) The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3 The total volatile organic compound (TVOC) concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed 500µg/m³ over 8 hours. The TVOC sampling and analysis is performed in accordance with ISO 16000-5 and ISO 16000-6. or ISO 16017-1. Where levels are found to exceed these limits, the project team confirms the measures that have, or will be, undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels to within the above limits. The measured concentration levels of formaldehyde (µg/m³) and TVOC (µg/m³) are reported, via the BREEAM Scoring and Reporting Tool.



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Hea 4 Thermal Comfort					
Hea 4a	Thermal Modelling	1	1	Thermal Modeller/M&E	<u>BREEAM Criteria</u> Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11). The modelling demonstrates that: a. For air conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design2, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type). b. For naturally ventilated/free running buildings: i. Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type). ii. The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings. For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool. EDUCATION SPECIFIC REQUIEMENTS: As an alternative to CIBSE TM52, an appropriate industry standard for schools is Building Bulletin 101, Ventilation of school buildings (April 2014). For schools with a straightforward servicing strategy, ClassCool is considered a suitable alternative to an AM11 full dynamic model.



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Hea 4b	Designing for Future Thermal Comfort	1	1	Thermal Modeller/M&E	<u>BREEAM Criteria</u> The thermal modelling demonstrates that the relevant requirements are achieved for a projected climate change environment. Where this is not met, the project team demonstrates how the building has been adapted or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements. For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.
Hea 4c	Thermal Zoning and Controls	1	1	Thermal Modeller/M&E	<u>BREEAM Criteria</u> The thermal modelling analysis has informed the temperature control strategy for the building and its users. The strategy for proposed heating or cooling systems demonstrates that it has addressed the following: a. Zones within the building, and how the building services could efficiently and appropriately heat or cool these areas. For example, consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows. b. The degree of occupant control required for these zones. This is based on discussions with the end user (or alternatively building type or use specific design guidance, case studies, feedback) and considers: - i User knowledge of building services. - ii Occupancy type, patterns and room functions (and therefore appropriate level of control required). - iii How the user is likely to operate or interact with the systems, e.g. are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings etc. - iv The user expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example some occupants like fresh air and others dislike draughts). c. How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants.



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Hea 5 - Acoustic Performance					
Hea 5a	Performance Standard	3	3	Acoustician	<u>BREEAM Criteria</u> The building meets the appropriate acoustic performance standards and testing requirements for the acoustic principles of: a. Sound insulation b. Indoor ambient noise level, and, c. Room acoustics. EDUCATION SPECIFIC REQUIEMENTS: Sound Insulation - Achieve the performance standards set out in Section 1 of Building Bulletin 93: Acoustic design of schools: performance standards, February 2015 (BB93)(87) relating to airborne sound insulation between spaces and impact sound insulation of floors. Indoor ambient noise levels - Achieve the indoor ambient noise level standards set out within Section 1 of BB93 for all room types. Room acoustics - Room acoustics (Control of reverberation, sound absorption and speech transmission index (STI)): <u>Teaching and study spaces</u> achieve the requirements relating to reverberation time for teaching and study spaces set out within Section 1 of BB93. <u>Open plan teaching spaces</u> achieve the performance requirements relating to reverberation time and STI set out within Section 1 of BB93. <u>Corridor and stairwells</u>, for those that give direct access to teaching and study spaces, achieve the performance requirements relating to sound absorption.
Hea 6 - Security					
Hea 6a	Consultation with ALO	1	1	Architect/ALO	<u>BREEAM Criteria:</u> A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent). The purpose of the SNA will be to identify attributes of the proposal, site and surroundings which may influence the approach to security for the development. The SQSS develops a set of security controls and recommendations for incorporation into the proposals. Those controls and recommendations shall directly relate to the threats and assets identified in the preceding SNA. The controls and recommendations shall be incorporated into proposals and implemented in the as-built development. Any deviation from those controls and recommendations shall be justified and agreed with the SQSS.



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Hea 7 – Safe and Healthy Surroundings					
Hea 7a	Safe Access	1	0	Architect/Landscape Architect	Credit Not Currently Sought <u>BREEAM Criteria</u> If the assessed building does not have any external areas and access to the building is direct from the public highway or footpath, then the criteria concerning safe access are not applicable and the credit can be awarded by default.
Hea 7b	Outside Space	1	1	Architect/Landscape Architect	<u>BREEAM Criteria</u> There is an outside space providing building users with an external amenity area.
Energy					
Ene 1 - Reduction of CO2 Emissions					
Ene 1a	Reduction of CO ₂ Emissions	9	1	Energy Assessor	<u>BREEAM Criteria</u> 1no. assumed credits – And EPR_{NC} of 0.1 a performance improvement better than the relevant national building regulations compliant standard.
Ene 1b	Prediction of Operational Energy Consumption	4	0	Energy Assessor/Design Team	Credits Not Sought <u>BREEAM Criteria</u> Involve relevant members of the design team in an energy design workshop focusing on operational energy performance. Undertake additional energy modelling during the design and post-construction stage to generate predicted operational energy consumption figures. Report predicted energy consumption targets by end use, design assumptions and input data (with justifications). Carry out a risk assessment to highlight any significant design, technical, and process risks that should be monitored and managed throughout the construction and commissioning process.



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Ene 2 - Energy Monitoring					
Ene 2a (MINIMUM STANDARD)	Sub-metering of major energy consuming systems	1	1	M&E	<u>BREEAM Criteria</u> Install energy metering systems so that at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories. Meter the energy consumption in buildings according to the total useful floor area: If the area is greater than 1,000m ² , by end-use category with an appropriate energy monitoring and management system. If the area is less than 1,000m ² , use either: an energy monitoring and management system or Separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system. Building users can identify the energy consuming end uses, for example through labelling or data outputs.
Ene 2b	Sub-metering of high energy load and tenancy areas	-	-	-	Not Applicable to Primary Schools
Ene 3 - External Lighting					
Ene 3	External Lighting	1	1	M&E	<u>BREEAM Criteria</u> The average initial luminous efficacy of the external light fittings within the construction zone is not less than 70 luminaire lumens per circuit Watt. External light fittings are automatically controlled for prevention of operation during daylight hours and presence detection in areas of intermittent pedestrian traffic.
Ene 4 - Low Carbon Design					
Ene 4a	Passive Design Analysis	1	1	M&E / Energy Assessor	<u>BREEAM Criteria</u> Achieve the first credit Hea 04 Thermal comfort: One credit - Thermal modelling to demonstrate that the building design delivers appropriate thermal comfort levels in occupied spaces. The project team analyses the proposed building design and development during Concept Design to identify opportunities for the implementation of passive design measures Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings. Quantify the reduced total energy demand and carbon dioxide (CO ₂ -eq) emissions resulting from the passive design measures.



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Ene 4b	Free Cooling	1	0	M&E / Energy Assessor	Credit Not Currently Sought
Ene 4b	LZC Technologies	1	1	M&E / Energy Assessor	<u>BREEAM Criteria</u> An energy specialist completes a feasibility study (see Low and zero carbon feasibility study on the next page) by the end of Concept Design. Establish the most appropriate recognised local (on-site or near-site) low and zero carbon (LZC) energy sources for the building or development based on the feasibility study. Specify local LZC technologies for the building or development in line with the feasibility study recommendations. Quantify the reduced regulated carbon dioxide (CO ₂ -eq) emissions resulting from the feasibility study.
Ene 6 - Energy Efficient Transportation Systems					
Ene 6	Lifts and Escalators	2	2	Lift Supplier	<u>BREEAM Criteria</u> Energy consumption For specified lifts, escalators or moving walks (transportation types): Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks Calculate the energy consumption in accordance with BS EN ISO 25745 Part 2 or Part 3 for one of the following: At least two options for each transportation type (e.g. for lifts, hydraulic, traction or machine roomless (MRL)) <u>OR</u> At least two options considering different system arrangements and control strategies. Consider the use of regenerative drives, subject to the requirements in Regenerative drives Specify the transportation system with the lowest energy consumption. Energy efficient features Specify the following three energy efficient features for each lift: - A standby condition for off-peak periods - The lift car lighting and display lighting provides an average luminous efficacy across all fittings in the car of > 70 luminaire lumens per circuit Watt - Use of a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor. Specify regenerative drives where their use is demonstrated to save energy.



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Ene 8 - Energy Efficient Equipment					
Ene 8	Energy Efficient Equipment	2	0	M&E/End Occupier	Credit Not Sought <u>BREEAM Criteria</u> Identify the building's unregulated energy consuming loads. Estimate their contribution to the total annual unregulated energy consumption of the building, assuming a typical or standard specification. Identify the systems or processes that use a significant proportion of the total annual unregulated energy consumption of the building. Demonstrate a meaningful reduction in the total annual unregulated energy consumption of the building. Table 6.5 (within the BREEAM Technical) lists some examples of significant contributors to unregulated energy consumption, and the associated criteria. If additional significant contributors, not listed in the table, will be specified, the design team should justify how a meaningful reduction will be achieved for these contributors.
Transport					
Tra 1 - Transport Assessment and Travel Plan					
Tra 1	Transport assessment and travel plan	2	2	BREEAM Assessor	<u>BREEAM Criteria</u> No later than Concept Design stage, undertake a site-specific transport assessment (or develop a travel statement) and draft travel plan, which can demonstrably be used to influence the site layout and built form; The site-specific travel assessment (or statement) shall cover as a minimum: - a: If relevant, travel patterns and attitudes of existing building or site users towards cycling, walking and public transport, to identify relevant constraints and opportunities. - b: Predicted travel patterns and transport impact of future building or site users. - c: Current local environment for pedestrians and cyclists, accounting for any age-related requirements of occupants and visitors. - d: Reporting of the number and type of existing accessible amenities, within 500m of the site. - e: Disabled access accounting for varying levels and types of disability, including visual impairment. - f: Calculation of the existing public transport Accessibility Index (AI), - g: Current facilities for cyclists. Following a transport assessment, a site-specific travel plan that provides a long-term management strategy which encourages more sustainable travel will be produced. The



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					travel plan includes measures to increase or improve more sustainable modes of transport and movement of people and goods during the building's operation.
Tra 2 – Sustainable Transport Measures					
Tra 2	Sustainable Transport Measures	10	6	BREEAM Assessor	<u>BREEAM Criteria</u> Identify the sustainable transport measures for the scheme, as follows: - Accessibility Index more than 8. - Install compliant cycle storage spaces - Install compliant cycle storage facilities (2 of the following to be implemented): - o Showers - o Lockers - o Changing facilities - o Drying room - Amenities within 500m - Enhanced amenity – Nursey Use (separate function) EDUCATION SPECIFIC REQUIREMENT: Install compliant cycle storage spaces need to be 5 spaces per form or class in a year group. Notes: Sites where the existing Accessibility Index (AI) indicated in option 1 is met (AI over 8), can reduce the number of compliant cycle spaces requirement by 50%.
Water					
Wat 1 - Water Consumption					
Wat 1 (MINIMUM STANDARD)	Water Consumption	5	3	Architect/M&E	<u>BREEAM Criteria</u> 3no. credits targeted which requires a 50% improvement over the BRE's baseline performance. Flow rate examples can be provided to meet this requirement. An assessment of the efficiency of newly specified domestic water-consuming components. The efficiency of the following 'domestic scale' water-consuming components must be included in the assessment: - WCs - Urinals - Taps (wash hand basins and where specified kitchen taps and waste disposal unit) - Showers - Baths - Dishwashers (domestic and commercial sized) and - Washing machine (domestic and commercial or industrial sized)



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Wat 2 - Water Monitoring					
Wat 2 (MINIMUM STANDARD)	Water Monitoring	1	1	M&E	<u>BREEAM Criteria</u> The specification of a water meter on the mains water supply to the building 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. 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.
Wat 3 - Water Leak Detection and Prevention					
Wat 3a	Leak Detection System	1	1	M&E	<u>BREEAM Criteria</u> A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter is installed. The leak detection system must be: a. A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks is installed. b. 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. c. Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods. d. Programmable to suit the owner/occupiers' water consumption criteria. e. Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.
Wat 3b	Water Leak Prevention	1	1	M&E	<u>BREEAM Criteria</u> Install flow control devices that regulate the water supply to each WC area or sanitary facility according to demand, in order to minimise undetected wastage and leaks from sanitary fittings and supply pipework.



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Wat 4 - Water Efficient Equipment					
Wat 4	Unregulated Water Use	1	1	Architect	<u>BREEAM Criteria</u> To be watered solely by precipitation throughout all seasons of the year.
Materials					
Mat 1 Environmental impacts from construction products - Building life cycle assessment (LCA)					
Mat 1	Environmental Impacts from Construction Products - Building Life Cycle Assessment (LCA)	7	0	Architect/Structural Engineer	Credits Not Sought <u>BREEAM Criteria</u> Creation of Life Cycle Assessments and integrating its outcomes in the design decision-making process.
Mat 2 - Environmental impacts from construction products – Environmental Product Declarations (EPD)					
Mat 2	Environmental Impacts from Construction products – (EPD)	1	1	Architect/Structural Engineer	<u>BREEAM Criteria</u> Specify construction products with EPD that achieve a total EPD points score of at least 20, according to the Methodology in the BREEAM Technical Manual.
Mat 3 - Responsible Sourcing of Materials					
Mat 3a (MINIMUM STANDARD)	Timber Procurement	Pre-Req.	Pre-req.	Main Contractor	<u>BREEAM Criteria</u> All timber used on site will be sourced in accordance with the UK Government's Timber Procurement Policy.
Mat 3b	Sustainable Procurement Plan	1	1	Main Contractor	<u>BREEAM Criteria</u> The principal contractor sources materials for the project in accordance with a documented sustainable procurement plan



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Mat 3c	Measuring Responsible Sourcing	3	1	Main Contractor	<u>BREEAM Criteria</u> Key building materials are responsibly sourced to reduce environmental and socio-economic impacts. There will be a materials procurement workshop such that the Main Contractor achieves at least one of three available credits in this area.
Mat 5 - Designing for Robustness					
Mat 5	Designing for Robustness	1	1	Architect	<u>BREEAM Criteria</u> Protecting vulnerable parts of the building from damage 1. The building incorporates suitable durability and protection measures or designed features/solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements. This must include, but is not necessarily limited to: a. Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc.). b. Protection against any internal vehicular/trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. Protecting exposed parts of the building from material degradation Environmental factors have been identified that are relevant to the site location. Existing applicable building elements that are exposed to any relevant environmental factors have been identified. Existing applicable building elements have been surveyed have been assessed to identify impacts of material degradation effects including an assessment to grade the severity of any degradation effects. Design and specification measures have to be developed to repair and protect existing elements according to the severity of any degradation affects, to limit degradation. Where it is not feasible to implement measures to limit material degradation for existing elements, justification should be provided. Newly specified materials or newly constructed elements (e.g. a new external wall) within the scope of construction works incorporate appropriate design and specification measures to limit material degradation due to environmental factors.
Mat 6 – Material Efficiency					
Mat 6	Material Efficiency	1	0	Design Team	Credits Not Sought <u>BREEAM Criteria</u> At the Preparation and Brief and Concept Design stages, set targets and report on opportunities and methods to optimise the use of materials. These must be done for each of the following stages.



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					Preparation and Brief Concept Design Developed Design Technical Design Construction. Develop and record the implementation of material efficiency, during: Developed Design Technical Design Construction. Report the targets and actual material efficiencies achieved.
Waste					
Wst 1 - Construction Waste Management					
Wst 1b	Pre-Demolition Audit	-	-	Developer	Not Applicable
Wst 1c	Construction Resource Efficiency	3	2	Main Contractor	<u>BREEAM Criteria</u> Resource Efficiency (up to three credits available) – Targeted 2 credits Targets will be set within the Site Waste Management Plan, and procedures put in place, to ensure that less than 7.5m ³ / 6.5T per 100 m ² (gross floor area) of non-hazardous construction waste will be produced on site.
Wst 1d	Diversion of waste from Landfill	1	1	Main Contractor	<u>BREEAM Criteria</u> Diversion from landfill – Targeted one credit Targets and procedures will be put in place to ensure that over 85% by volume / 90% by weight of construction waste generated is diverted from landfill and that materials will be sorted into key waste groups.
Wst 2 -Use of recycled and sustainably sourced aggregates					
Wst 2	Recycled Aggregates	1	0	Main Contractor/Structural Engineer	Credit Not Sought <u>BREEAM Criteria</u> - Identify all aggregate uses and types on the project - Determine the quantity in tonnes for each identified use and aggregate type. - Identify the region in which the aggregate source is located. - Calculate the distance in kilometres travelled by all aggregates by transport type Enter the information into the BREEAM Wst 02 calculator to calculate the Project Sustainable Aggregate points.



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Wst 3 - Recyclable Waste Storage					
Wst 3	Recyclable Waste Storage	1	1	Architect/ building Owner	<u>BREEAM Criteria</u> Dedicated space(s) is provided for the segregation and storage of operational recyclable waste volumes generated by the assessed building/unit, its occupant(s) and activities. This space must be: a. Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams b. Accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors c. Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily/weekly operational activities and occupancy rates. Where food waste is to be generated, a water outlet is provided adjacent to or within the facility for cleaning and hygiene purposes where organic waste is to be stored or composted on site.
Wst 4 – Speculative Finishes					
Wst 4	Speculative Finishes	-	-	Architect / Occupant	Credit Not Applicable
Wst 5 – Adaptability to Climate Change					
Wst 5	Adaptability to Climate Change	1	1	Architect / Structural Engineer	<u>BREEAM Criteria</u> Conduct a climate change adaptation strategy appraisal for structural and fabric resilience by the end of Concept Design (RIBA Stage 2 or equivalent), in accordance with the following approach: Carry out a systematic (structural and fabric resilience specific) risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages: • Hazard identification • Hazard assessment • Risk estimation • iv. Risk evaluation • Risk management.



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Wst 6 – Design for disassembly and adaptability					
Wst 6	Design for Disassembly and Adaptability	2	2	Architect / Structural Engineer	<u>BREEAM Criteria</u> A building-specific functional adaptation strategy study to be undertaken by the client. Functional adaptation measures have been adopted in the design by Technical Design stage (RIBA Stage 4 or equivalent) in accordance with the functional adaptation strategy recommendations, where practical and cost effective. Omissions have been justified in writing to the assessor.
Land Use and Ecology					
Le 1 – Site Selection					
Le 1a	Site Selection	1	1	Architect	<u>BREEAM Criteria</u> Proposed development on a pre-developed site - At least 75% of the proposed development's footprint is on an area of land which has previously been occupied.
Le1b	Contaminated Land	1	0	Contaminated Land Specialist	Credit Not Sought <u>BREEAM Criteria</u> A contaminated land professional's site investigation, risk assessment and appraisal has deemed land within the site to be affected by contamination. The site investigation, risk assessment and appraisal have identified: - The degree of contamination - The contaminant sources or types - The options for remediating sources of contamination which present an unacceptable risk. The client or principal contractor confirms that remediation of the site will be carried out in accordance with the remediation strategy and its implementation plan as recommended by the contaminated land professional.



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Le 2 - Identifying and Understanding the Risks and Opportunities for the Project					
Le 2	Identifying and Understanding the Risks and Opportunities for the Project	2	2	Ecologist / Design Team	<u>BREEAM Criteria</u> Identifying and understanding the ecological risks and opportunities associated with the site to inform the determination of the strategic outcome for the site.
Le 3 - Managing Negative Impacts on Ecology					
Le 3	Managing Negative Impacts on Ecology	3	3	Ecologist / Design Team / Contractor	<u>BREEAM Criteria</u> Recognition of steps taken to avoid impacts on existing site ecology as far as possible.
Le 4 - Change and Enhancement of Ecological Value					
Le 4	Change and Enhancement of Ecological Value	4	2	Ecologist / Design Team / Main Contractor	<u>BREEAM Criteria</u> Recognition of steps taken to enhance site ecology. Minimising loss of ecological value – conservative award of credits
LE 5 - Long Term Ecology Management and Maintenance					
Le 5	Long Term Ecology Management and Maintenance	2	2	Ecologist/ Main Contractor	<u>BREEAM Criteria</u> Encouraging the long-term maintenance and management of ecology on site to ensure both new and existing ecological features continue to thrive.



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Pollution					
Pol 1 – Impact of Refrigerants					
Pol 1	Impact of Refrigerants	2	1	M&E	<u>BREEAM Criteria</u> All systems with electric compressors comply with the requirements of BS EN 378:2016(204) (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice. The direct effect life cycle CO ₂ equivalent emissions (DELCO) of ≤1000 CO ₂ -eq/kW. For systems which provide cooling and heating, the worst performing output based on the lower of kW cooling output and kW heating output is used to complete the calculation. OR All refrigerants used have a global warming potential (GWP) ≤10.
		1	1		<u>BREEAM Criteria</u> All systems are hermetically sealed or only use environmentally benign refrigerants OR Where the systems are not hermetically sealed: Systems have: A permanent automated refrigerant leak detection system, that is robust and tested, and capable of continuously monitoring for leaks. OR An inbuilt automated diagnostic procedure for detecting leakage is enabled.
Pol 2 – Local Air Quality					
Pol 2	Local Air Quality	2	2	M&E	<u>BREEAM Criteria</u> All heating and hot water is supplied by non-combustion systems. For example, only powered by electricity OR Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels set in Table 12.4 and Table 12.5 of the BREEAM Technical Manual. E.g. Gas boilers to have maximum NOx emissions of 24mg/kWh.



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Pol 3 Surface Water Run-Off					
Pol 3a	Flood Risk	2	2	Flood Risk Specialist	<u>BREEAM Criteria</u> The site lies in Flood Zone 1, the zone of lowest flood risk.
Pol 3b	Surface Water Run-off (Rate)	1	1	Drainage Consultant	<u>BREEAM Criteria</u> For brownfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place. Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance.
Pol 3c	Surface Water Run-off (Volume)	1	1	Drainage Consultant	<u>BREEAM Criteria</u> Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. This must be for the 100-year 6-hour event, including an allowance for climate change. Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques.



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Pol 3d	Minimising Watercourse Pollution	1	0	Drainage Consultant	Credit Not Currently Sought <u>BREEAM Criteria</u> There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant). Areas with a low risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques. Areas with a high risk of contamination or spillage of substances, such as petrol and oil, have separators (or an equivalent system) are installed in surface water drainage systems. Chemical or liquid gas storage areas have a means of containment fitted to the site drainage system (i.e. shut-off valves). This is to prevent the escape of chemicals to natural watercourses in the event of a spillage or bunding failure. All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS manual and other relevant industry best practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site. A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place. All external storage and delivery areas are designed and detailed in accordance with the current best practice planning guidance.
Pol 4 – Reduction of Night-time Light Pollution					
Pol 4	Reduction of Night-time Light Pollution	1	1	M&E	<u>BREEAM Criteria</u> The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the Institution of Lighting Professionals (ILP) Guidance notes for the reduction of obtrusive light, 2011. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP guidance notes. Where specified, illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.



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Pol 5 – Noise Attenuation					
Pol 5	Noise Attenuation	1	1	Acoustician/M&E	<u>BREEAM Criteria</u> Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014 is commissioned. Noise levels must be measured or determined for: - Existing background noise levels: at the nearest or most exposed noise-sensitive development to the proposed assessed site including existing plant on a building, where the assessed development is an extension to the building - Noise rating level from the assessed building. - The noise impact assessment must be carried out by a suitably qualified acoustic consultant. - The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise sensitive development, must be at least 5dB lower than the background noise throughout the day and night. - If the noise sources from the assessed building are greater than the levels, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.



Appendix B – Indicative SBEM Calculations (BRUKL Report)



Project name

Primary School**As designed****Date:** Fri Sep 18 16:58:39 2020**Administrative information****Building Details****Address:** Crown Street, Manchester,**Certification tool****Calculation engine:** EnergyPlus**Calculation engine version:** "v8.9.0.001"**Interface to calculation engine:** DesignBuilder DSM**Interface to calculation engine version:** v6.1.0**BRUKL compliance check version:** v5.6.a.1**Owner Details****Name:****Telephone number:****Address:** , ,**Certifier details****Name:** Colin Sowerbutts**Telephone number:** 01829 733444**Address:** 75A High Street, Tarvin, CH3 8JA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	11.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	11.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	9.8
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.21	0.48	Second floor - Circulation_W_14
Floor	0.25	0.11	0.11	Ground Floor - Circulation_1_S_0
Roof	0.25	0.22	1	First floor - LRC_C_1
Windows***, roof windows, and rooflights	2.2	1.4	1.4	Ground Floor - Circulation_1_G_3_1
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- C3 heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- Panel heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Project

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.001
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
Ground Floor - Circulation 1	-	-	-	1.5	-	-	-	-	-	-	0.85	0.5
Ground Floor - SEN therapy and resource	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Plant Room	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Store	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Kitchen	0.3	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Repro	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Sick bay	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Small group	-	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Dis WC	0.3	-	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
Ground Floor - Interview	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Head	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Office	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Reception	-	-	-	1.5	-	-	-	-	-	0.85	0.5
Ground Floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Toilets 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Cloakroom 1	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Nursery	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Cloakroom	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Toilets	0.3	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - Hygiene	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Hall	-	-	-	1.5	-	-	-	-	-	0.85	0.5
First floor - Circulation	-	-	-	1.5	-	-	-	-	-	0.85	0.5
First floor - Staff room	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Server room	-	-	-	-	-	-	-	-	-	-	N/A
First floor - LRC	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Kitchen	0.3	-	-	-	-	-	-	-	-	-	N/A
First floor - Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
First floor - Year 2	-	0.3	-	-	-	-	-	-	-	-	N/A
First floor - Year 1	-	0.3	-	-	-	-	-	-	-	-	N/A
First floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Store room	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Store room	-	-	-	-	-	-	-	-	-	-	N/A
First floor - Small group	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Ciculation	-	-	-	1.5	-	-	-	-	-	0.85	0.5
Second floor - Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Second floor - Year 3	-	0.3	-	-	-	-	-	-	-	-	N/A
Second floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Food bay	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Year 4	-	0.3	-	-	-	-	-	-	-	-	N/A
Second floor - Year 5	-	0.3	-	-	-	-	-	-	-	-	N/A
Second floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Second floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Third floor - Circulation	-	-	-	1.5	-	-	-	-	-	0.85	0.5
Third floor - Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Third floor - Year 6	-	0.3	-	-	-	-	-	-	-	-	N/A
Third floor - Store	-	-	-	-	-	-	-	-	-	-	N/A
Third floor - Store	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Ground Floor - Circulation 1	-	140	-	207
Ground Floor - SEN therapy and resource	140	-	-	143
Ground Floor - Plant Room	140	-	-	100
Ground Floor - Store	140	-	-	9
Ground Floor - Kitchen	-	140	-	90
Ground Floor - Repro	140	-	-	63
Ground Floor - Sick bay	140	-	-	56
Ground Floor - Small group	140	-	-	49
Ground Floor - Dis WC	-	140	-	27
Ground Floor - Interview	140	-	-	83
Ground Floor - Head	140	-	-	112
Ground Floor - Office	140	-	-	86
Ground Floor - Circulation	-	140	-	18
Ground Floor - Reception	-	140	140	152
Ground Floor - Store	140	-	-	9
Ground Floor - Toilets 1	-	140	-	40
Ground Floor - Cloakroom 1	140	-	-	10
Ground Floor - Nursery	140	-	-	222
Ground Floor - Cloakroom	140	-	-	10
Ground Floor - Toilets	-	140	-	40
Ground Floor - Hygiene	140	-	-	74
First floor - Hall	140	-	-	698
First floor - Circulation	-	140	-	180
First floor - Staff room	140	-	-	292
First floor - Server room	140	-	-	47
First floor - LRC	140	-	-	101
First floor - Store	140	-	-	16
First floor - Kitchen	-	140	-	283
First floor - Toilet	-	140	-	76
First floor - Year 2	140	-	-	207
First floor - Year 1	140	-	-	205
First floor - Store	140	-	-	19
First floor - Store room	140	-	-	4
First floor - Store room	140	-	-	4
First floor - Small group	140	-	-	70
Second floor - Ciculation	-	140	-	142
Second floor - Toilet	-	140	-	55
Second floor - Year 3	140	-	-	221
Second floor - Store	140	-	-	9
Second floor - Food bay	140	-	-	25
Second floor - Year 4	140	-	-	204
Second floor - Year 5	140	-	-	211

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Second floor - Store	140	-	-	8
Second floor - Store	140	-	-	4
Second floor - Store	140	-	-	4
Second floor - Store	140	-	-	4
Third floor - Circulation	-	140	-	109
Third floor - Toilet	-	140	-	50
Third floor - Year 6	140	-	-	196
Third floor - Store	140	-	-	12
Third floor - Store	140	-	-	3

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground Floor - SEN therapy and resource	NO (-66.3%)	YES
Ground Floor - Repro	NO (-80%)	YES
Ground Floor - Sick bay	NO (-68.6%)	YES
Ground Floor - Small group	N/A	N/A
Ground Floor - Interview	NO (-83.1%)	YES
Ground Floor - Head	NO (-74%)	YES
Ground Floor - Office	NO (-34.9%)	YES
Ground Floor - Reception	NO (-25.2%)	YES
Ground Floor - Nursery	NO (-31%)	YES
Ground Floor - Hygiene	N/A	N/A
First floor - Hall	NO (-63.3%)	YES
First floor - Staff room	NO (-59.7%)	YES
First floor - LRC	NO (-58.4%)	YES
First floor - Year 2	NO (-31%)	YES
First floor - Year 1	NO (-34.9%)	YES
First floor - Small group	NO (-60.4%)	YES
Second floor - Year 3	NO (-60.7%)	YES
Second floor - Year 4	NO (-31%)	YES
Second floor - Year 5	NO (-35.2%)	YES
Third floor - Year 6	NO (-60%)	YES

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	1694.8	1694.8
External area [m ²]	2648.8	2648.8
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	1177.98	1184.7
Average U-value [W/m ² K]	0.44	0.45
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Institutions: Hospitals and Care Homes
C2 Residential Institutions: Residential schools
C2 Residential Institutions: Universities and colleges
C2A Secure Residential Institutions
Residential spaces
D1 Non-residential Institutions: Community/Day Centre
D1 Non-residential Institutions: Libraries, Museums, and Galleries
100 D1 Non-residential Institutions: Education
D1 Non-residential Institutions: Primary Health Care Building
D1 Non-residential Institutions: Crown and County Courts
D2 General Assembly and Leisure, Night Clubs, and Theatres
Others: Passenger terminals
Others: Emergency services
Others: Miscellaneous 24hr activities
Others: Car Parks 24 hrs
Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.25	7.05
Cooling	0	0
Auxiliary	5.77	3.82
Lighting	7.34	11.92
Hot water	0.93	1.7
Equipment*	21.43	21.43
TOTAL **	19.29	24.5

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	46.58	45.57
Primary energy* [kWh/m ²]	57.73	68.06
Total emissions [kg/m ²]	9.8	11.9

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

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	42.2	0	2.5	0	5.5	4.7	0	5	0	
Notional	42.1	0	4.8	0	3.9	2.43	0	----	----	
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity										
Actual	84	0	27.7	0	8	0.84	0	1	0	
Notional	75	0	25.4	0	3	0.82	0	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.2	Ground Floor - Circulation 1_W_3
Floor	0.2	0.11	Ground Floor - Circulation 1_S_0
Roof	0.15	0.2	Ground Floor - Circulation 1_R_1
Windows, roof windows, and rooflights	1.5	1.4	Ground Floor - Circulation 1_G_3_1
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3