The planning application for the redevelopment of BXC is accompanied by a range of technical and supporting documents/reports. This is explained in full in the Development Speci cation and Framework (Volume BXC1). However, it may be useful, if viewing this document in isolation, to rst read a short note on the Introduction to the Planning Application , which can be found on BXC Development Partners website (www.brentcrosscricklewood.com).

An Addendum to the Environmental Sustainability Strategy was originally submitted in November 2008 and contained updated chapters to the document. The Appendices of original Environmental Sustainability Strategy March 2008 were retained. This Revised Addendum replaces in full the November 2008 Addendum. For a complete copy of the Environmental Sustainability Strategy, the March 2008 version needs to be read alongside this March 2009 Revised Addendum.

Revision	Description	Issued by	Date	Checked
01	Sustainability Report (Draft 1.1)	Bill Addis	July 2006	
01.1	Sustainability Report (Draft 1.2)	Bill Addis	August 2006	
01.2	Sustainability Report (Draft 1.3)	Bill Addis	October 2006	
01.3	Sustainability Report (2.1)	Bill Addis	April 2007	
01.4	Sustainability Report (2.2)	Bill Addis	June 2007	
01.5	Sustainability Report (3.1)	Bill Addis	February 2008	
01.6	Sustainability Report (4.1)	Bill Addis	March 2008	
01.7	Sustainability Report (5.1)	Bill Addis	October 2008	
01.8	Sustainability Report (6.1)	Bill Addis	March 2009	

report collation

signature

date

approval

signature **Bill Addis**

date **24 th March 2009**

Contents

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Summary

The purpose of this report is to outline the environmental sustainability strategy for the proposed development of the Brent Cross Cricklewood (BXC) regeneration site in the London Borough of Barnet, and, in particular, to demonstrate how the proposed design, construction and operation will meet the appropriate planning policies of the London Borough of Barnet and the Greater London Authority.

The report contains the following sections:

- a review of the drivers for sustainability and how they have influenced and will continue to influence the proposed development;
- a summary of the sustainable features in the proposed development;
- an assessment of the proposed sustainable features; and
- an outline of how the sustainability features will be delivered.

Environmental sustainability is at the heart of the Brent Cross Cricklewood development and sustainability issues permeate the development proposals. The Environmental Sustainability Strategy addresses those sustainability issues related to environmental impact and the depletion of natural resources. The remaining social and economic aspects of sustainable development are addressed in many parts of the application, including the Regeneration Strategy (Volume BXC12) and the specific chapters of the Environmental Statement (Volume BXC2).

The very location and nature of the BXC site means that the proposed development is intrinsically environmentally sustainable in a number of respects. The entire site comprises brownfield land and is located in close proximity to existing public transport nodes including Brent Cross London Underground station, Cricklewood over ground railway station and the bus interchange at Brent Cross shopping centre.

The Environmental Sustainability Strategy outlines how the Development Partners propose to address the reduction of environmental impact and the depletion of natural resources. This includes responding to the current policies of National Government, the Greater London Authority and the London Borough of Barnet, as well as proposing to implement a number of initiatives that will take the development well beyond the minimum threshold required to meet the planning policies and the requirements of current environmental legislation and building regulations.

The Development Partners key commitments to environmental sustainability can be summarised as follows:

- delivering virtually all the Essential Standards the Mayor's SPG on Sustainable Design and Construction;
- delivering the majority of the Mayor's Preferred Standards in the Mayor's SPG;
- provide a large scale CHP plant, the fuel for which will be either a Refuse Derived Fuel or natural gas;
- subject to agreement with LBB and GLA and relevant Stakeholders and, in particular, the North London Waste Authority, provide technology that will treat residual non-recyclable waste from the waste handling facility to create a refuse-derived fuel (RDF) to supply the large scale CHP plant. The Development Partners have undertaken a feasibility study of recovering energy from waste collected at the waste handling facility which could achieve reductions in carbon dioxide emissions of 50-60% compared to Building Regulations Part L (2006). This, in conjunction with an underground vacuum waste-collection system (such as Envac), will be unique in the UK;

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- a baseline position that residential buildings will achieve a reduction in carbon dioxide emissions of at least 44% below the requirements of the Building Regulations (2006) Part L, and non-residential buildings at least 20% below, of which a proportion will be due to the use of renewable energy sources;
- providing district heating infrastructure linked to the large scale CHP that will mean buildings are able to gain the benefits of site-wide energy generation. This will also allow new environmentally-friendly energy sources to be introduced as they are developed and become sufficiently reliable on a large scale, including refuse-derived fuels, such as synthetic gas, biomass and hydrogen.
- using the ICE's Demolition Protocol and WRAP's Recycled-content Toolkit to ensure the effective reclamation, reuse and recycling of materials arising from demolition;
- rainwater harvesting will be designed to capture 10% of rain falling on the site for irrigation and cleansing use, and 'grey' water will be recycled from commercial buildings, if that proves necessary to meet demand;
- providing brown or green roofs on 10% of the available new roof area.

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It is significant that the majority of these features are to be provided in the Primary Development Package (PDP), including:

- the re-provision of a waste handling facility, incorporating the appropriate technology to treat residual waste to create an RDF, for use in the CHP (subject to agreement with relevant parties);
- providing large-scale CHP with associated district heating network;
- Residential buildings will achieve a reduction in carbon dioxide emissions of at least 44%, and non-residential buildings at least 20% lower than Building Regulations (2006) Part L, of which a proportion will be due to using energy generated from renewable sources);
- providing buildings that will be served by centralised plant to facilitate the easy future conversion to more environmentally-friendly fuels such as hydrogen, as and when they are developed for large-scale use and have proved their reliability;
- provide the infrastructure to all buildings and public realm, as appropriate, which would enable the vacuum waste collection system to be employed at a later date;
- rainwater harvesting will be designed to capture 10% of rain falling on the site for irrigation and cleansing use;
- providing green or brown roofs on 10% of the available roof area;
- deliver an exemplar building.

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In view of the above it is clear that the Development Partners are committed to providing the necessary infrastructure that will allow the introduction of new and emerging energy generation technologies and fuels when they become available and have been proved reliable.

The Development Partners have undertaken detailed studies on the viability of energy-from-waste schemes and it is their intention to treat residual non-recyclable waste from the development and surrounding boroughs, to create a fuel for the large scale CHP plant, thus supplying heat and power and, potentially, cooling to the development. The waste treatment plant is likely to be operated by North London Waste Authority and therefore their approval to the use of such technologies is required. The waste facility will be provided in the PDP and, if consent is obtained for the inclusion of appropriate CHP technology, reductions in the order of 50-60% in emissions of carbon dioxide (compared to Part L 2006), will be achieved.

The Development Partners are committed to meeting virtually all the "Essential Standards" set out in the Mayor of London's Supplementary Planning Guidance on "Sustainable Design and Construction" (Greater London Authority, May 2006), as well as the majority of the "Mayor's Preferred Standards" contained in the same document.

The Development Partners for BXC are fully committed to ensuring environmental sustainability forms a central thread running through every aspect of the proposed development. In order to ensure the relevant policies are met, a series of Environmental Sustainability Objectives have been agreed (see Section 3.2, below). These provide, and will continue to provide, a set of principles to guide the masterplanning team and those engaged with the design, construction and operation of the individual buildings at BXC. They embrace the main environmental impacts addressed in the Environmental Statement – water use, global atmospheric impacts and local air quality, outdoor and indoor environments, land use, ecology, materials and waste.

Delivery of the Environmental Sustainability Objectives

The environmental sustainability objectives will be delivered through the implementation of a number of specific strategies:

1. Materials Resource Efficiency Strategy
2. Energy Strategy
3. Water Resource Efficiency Strategy
4. Operational Waste Strategy
5. Building Performance, including Exemplar Building

1. Materials Resource Efficiency Strategy

The environmental impact related to the use of materials will be minimised in a number of ways:

- A number of materials will be proscribed or only used when there is no viable alternative. These include: materials that deplete the ozone layer or contribute to global warming (the Montreal Protocol List), timber that comes from non-sustainable forests, peat, and natural weathered limestone.
- Construction materials will be selected from the A+, A, B or C-rated options given in the Green Guide to Specification published by the BRE (2009) except when other construction methods and materials are necessary to meet structural and environmental design codes.
- Construction waste will be minimised through the implementation of Site Waste Management Plans, the details of which will be included in the Code of Construction Practice that will accompany the Environmental Statement.
- Reclaimed or recycled materials will be used, and specifiers will be expected to make use of best-practice guidance and product information regarding recycled-content building products. The WRAP Recycled-content Toolkit will be used to help monitor recycled content and establish best practice targets.
- Subject to their suitability for reclamation, reuse or recycling, materials arising from demolition will be reclaimed and either used on site, or sold for use elsewhere, or otherwise recycled in order that they do not have to be sent to landfill sites. This process will be managed through use of the Institution of Civil Engineers' Demolition Protocol.

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2. Energy Strategy

The Energy Strategy will be:

- To reduce carbon dioxide emissions by passive, active and renewable means;
- To invest in carbon dioxide reductions by concentrating expenditure where it will achieve optimum benefit to the environment;

- To reduce the demand for energy by design and construction of energy efficient buildings, avoidance of mechanical cooling, reduction of thermal energy transfer by means of building form, materials and orientation, and use of low-energy appliances such as low energy luminaries;
- To use and distribute energy efficiently, including reducing avoiding transmission losses by use of local (BXC) co-generation schemes;
- To distribute energy efficiently, for example through district heating networks that are compatible with cogeneration and tri-generation systems;
- To provide a future-ready solution to enable emerging technologies such as fuel cells to be adopted when these become sufficiently reliable on a large scale, and
- To use renewable energy sources, such as refuse-derived fuels to drive a major CHP plant that will deliver both heat and electrical power to the site, and to use other renewable energy sources that are appropriate to nature and size of the energy demand identified, and that have been proved to be sufficiently robust and reliable.
- To reduce emissions of carbon dioxide in residential buildings by at least 44% compared to Building Regulations Part L (2006), which will meet the energy/emissions level needed to achieve a Code for Sustainable Homes 4* rating.
- To reduce emissions of carbon dioxide in non-residential buildings by at least 20%, compared to Building Regulations Part L (2006).

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Further details of the energy and carbon dioxide emissions strategy are provided in the Energy Strategy and Assessment Report (Volume BXC 9).

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3. Water Resource Efficiency Strategy

The use of water in buildings will be minimised through specification of low-water-use fittings such as taps, showers and toilets as well as A-rated white goods. Residential buildings will be designed to achieve water usage of 105 litres/person/day which meets the requirement for a 4-star rating using the Code for Sustainable Homes and exceeds the Mayor's Essential Standard in the GLA's Supplementary Planning Guidance on Sustainable Design and Construction (currently 110 l/p/d).

Rainwater harvesting will be designed to capture 10% of rain falling on the site for irrigation and cleansing use. In addition, a commitment will be made to install green or brown roofs on 10% of the available roof area. This will help mitigate the Urban Heat Island Effect.

The extent to which grey water will be recycled for individual buildings will be established by undertaking detailed viability studies at the design stage, at which time targets will be set according to the building type/use and occupancy level. The water use will be assessed using the appropriate BREEAM / Code for Sustainable Homes methodology.

The Drainage Strategy (Volume BXC 15) outlines how Sustainable Urban Drainage Systems achieve the attenuation of storm water to reduce drainage rate as near to that for a green field site as possible.

4. Operational Waste Strategy

The comprehensive waste strategy will address waste arising from demolition, construction and operational phases.

Two important sustainable technology initiatives are proposed for management of waste for the operational phases, subject to feasibility:

- The use of a vacuum system for collecting waste through a network of underground ducts and delivering it direct to the local waste handling facility. This system offers a range of benefits including the ability to co-manage household and commercial waste streams, encouraging householders to recycle, reducing space requirements for waste storage and reducing waste transportation;
- Treat residual (non-recyclable) waste to create a refuse-derived fuel for use in the main CHP plant. The renewable energy thus generated will considerably reduce the carbon dioxide emissions from the site.

With regard to waste during the operational phase, the following provisions will be adopted:

- The primary responsibility for waste management will lie with the producer, particularly with regard to implementing measures to reduce the generation of waste, and encourage its recycling.
- Residential buildings will be provided with separated dedicated storage space to facilitate recycling and composting of at least 40% of household waste. The design and nature of waste storage will not preclude the ability to achieve higher recycling targets.
- Commercial buildings will include storage space for segregated waste enabling the commercial operators to recycle this as easily as possible.
- Compostable waste will be segregated for composting and will include onsite composting of some green waste from open spaces.
- Recycling facilities will be as easy to access as waste facilities.
- Facilities and systems will be provided to compost and recycle a minimum of 60% of commercial and industrial waste with an aspiration to achieve 70% by 2020.

It should be recognised that whilst the Development Partners will provide appropriate facilities to facilitate high recycling and composting performance, success in meeting these targets will only be achieved through the coordinated efforts and support of waste stakeholders including the Developers, waste producers and Barnet Council.

5. Building performance

Commercial/office buildings will be designed and constructed to achieve a rating equivalent to a "Very Good" rating using BREEAM-for-Offices (2006), with an aspiration for "Excellent".

The performance of residential buildings will achieve at least a 3* rating under the Code for Sustainable Homes (CSH). Residential buildings will be designed to achieve a water use target of 105 litres/person/day which will meet the minimum level required to achieve a 3* or 4* rating under the CSH. Since all residential buildings will achieve carbon dioxide emissions at least 44% below Building Regulations Part L (2006), this will mean that carbon dioxide emissions from residential buildings will exceed the minimum level required to achieve a 4* rating under the CSH. However, if the renewable fuel is made from the residual waste that is planned for the Primary Development Package, then the reduction in carbon dioxide emissions are likely to exceed even the 44% level of reduction.

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The Development Partners will construct the Claremont Primary School as an exemplar development, in line with the London Plan, to achieve an "Excellent" rating under BREEAM for Schools.

All buildings will be designed and constructed so that they meet current Building Regulations.

1 Introduction

1.1 Scope and Purpose of the Environmental Sustainability Strategy

This Environmental Sustainability Strategy explains the methods by which the Brent Cross Cricklewood (BXC) Development Partners will explore and address the issue of sustainable development.

Sustainable development comprises four main sets of issues:

- Social
- Economic
- Environmental impact
- Depletion of natural resources

Environmental sustainability is at the heart of the BXC development and sustainability issues permeate the entire content of the planning application and the development proposals themselves. This Environmental Sustainability Strategy addresses those sustainability issues related to environmental impact and the depletion of natural resources. The remaining social and economic aspects of sustainable development are addressed in many parts of the application, including the Regeneration Strategy (Volume BXC 12) and the specific chapters of the Environmental Statement (Volume BXC 2).

The main purpose of the Environmental Sustainability Strategy is to ensure that the proposed development at BXC achieves high standards of environmental performance.

The Strategy outlines the approaches taken in the development proposals to reducing environmental impact and the depletion of natural resources, and explains how the measures proposed will respond appropriately to the sustainability policies of National Government, the Greater London Authority and the London Borough of Barnet.

1.2 Status of the Environmental Sustainability Strategy

This Environmental Sustainability Strategy is submitted as a supporting document to the planning application. It summarises how the environmental sustainability objectives for the development will be delivered by means of a series of strategies addressing the various environmental issues. Key commitments from this document are reflected in the Development Specification & Framework (BXC1). The Development Partners anticipate a planning condition which requires all relevant reserved matter applications to be consistent with the Development Specification and Framework, unless otherwise agreed in writing with the LPA.

Materials Resource Efficiency Strategy

This strategy outlines how construction materials will be dealt with during both the demolition and construction stages. The strategy contained in Appendix D of this strategy and is summarised in Chapter 4, below.

Energy Strategy and Assessment Report

This strategy addresses the means by which the emissions of carbon dioxide will be reduced by reducing the demand for energy as far as possible, increasing the efficiency of its use, generating energy locally using Combined Heat and Power systems, and, where appropriate, using renewable sources of energy. It is described in the Energy Strategy and Assessment Report (Volume BXC 9). The strategy is summarised in Chapter 5 of this document.

Water Resource Efficiency Strategy

This strategy addresses the means by which the demand for potable water will be reduced by the use of low water-use appliances and by substituting other sources of water such as rain water and treated grey water. The strategy is summarised in Chapter 6 of this document and included in full in Appendix E.

Operational Waste Strategy

This strategy addresses the means by which waste arising from the operation of the various buildings in the development will be collected and treated in ways that will reduce the waste sent to landfill sites. This will be achieved by facilitating the recycling of materials, the composting of organic waste and the conversion of the residual waste into a Refuse Derived Fuel. It is described in the Operational Waste Strategy in Chapter 7 of this document. Further details of the treatment of the operational waste are to be found in the Waste Chapter of the Environmental Statement (Volume BXC 2).

Public Realm and Open Space Strategy

The Public Realm and Open Space Strategy (Volume BXC 7) is submitted in support of the application and includes proposals for public space as well as enhancing the natural environment. A summary of the key measures that will enhance the environmental sustainability are given in Section 9.1 of this document.

Transport Assessment

A Transport Assessment (Volume BXC 5) is submitted as a technical report in support of the application. A summary of the measures for sustainable transport provision described in that report are repeated in Section 9.2 of this document.

Drainage

A Drainage Strategy (Volume BXC 15) is submitted as a technical report in support of the application. A summary of the measures proposed in that report for delivery of an appropriate Sustainable Urban Drainage Strategy (SUDS) is repeated in Section 9.3 of this document.

1.3 Structure of the report

Chapter 2 of the strategy presents an overview of sustainable development in the context of the Cricklewood, Brent Cross and West Hendon Regeneration Area.

Chapter 3 presents a summary of the Development Partners proposals and commitments for Environmental Sustainability at BXC. It includes two tables that indicate how the proposed development will meet all the "essential standards" and the majority of the "Preferred standards" listed in the Mayor's Supplementary Planning Guidance on "Sustainable Design and Construction" (May 2006).

Chapter 4 presents a summary of the Materials Resource Efficiency Strategy.

Chapter 5 presents a summary of the Energy Strategy and Assessment Report which is submitted as a separate document to support the planning application.

Chapter 6 presents a summary of the Water Resources Efficiency Strategy.

Chapter 7 presents the Operational Waste Strategy.

Chapter 8 of the strategy presents the approach to dealing with various global and local environmental impacts not addressed in other chapters. These issues are elaborated in detail in the Environmental Statement.

Chapter 9 provides a summary of sustainability issues that arise in three other strategy documents that are submitted as separate documents in support of the planning application – the Public Realm and Open Space Strategy, the Transport Assessment, and the Drainage Strategy.

Chapter 10 explains how the Environmental Sustainability Strategy will be implemented.

Appendices A-C contain the key national, regional and local planning policies that have been considered in developing the masterplan.

Appendix D contains the Materials Resource Efficiency Strategy.

Appendix E contains the Water Resource Efficiency Strategy.

2 Sustainable Development and the Regeneration of Brent Cross Cricklewood

2.1 Brent Cross Cricklewood – an Opportunity Area

BXC is identified in the *London Plan – Consolidated with Alterations since 2004* (February 2008) as one of twenty eight Opportunity Areas in the Adopted London Plan, and the only one in the London Borough of Barnet.

London Plan Consolidated with Alterations since 2004 (Adopted February 2008)

Policy 2A.5 Opportunity Areas

As part of the process of producing Sub-Regional Implementation Frameworks, strategic partners should work with the Mayor to prepare, and then implement, spatial planning frameworks for Opportunity Areas . . . or to build on frameworks already developed. These frameworks will set out a sustainable development programme for each Opportunity Area, to be reflected in DPDs, so as to contribute to the overall strategy of the London Plan to:

- seek to exceed the minimum guidelines for housing having regard to indicative estimates of employment capacity set out in the subregional tables
- maximise access by public transport
- promote social and economic inclusion and relate development to the surrounding areas, especially any nearby Areas for Regeneration
- take account of the community, environmental and other distinctive local characteristics of each area
- deliver good design, including public realm, open space and, where appropriate, tall buildings
- co-ordinate development that crosses borough boundaries where appropriate

Opportunity Areas have been identified on the basis that they are capable of accommodating substantial new jobs or homes and their potential should be maximised. Typically, each can accommodate at least 5,000 jobs or 2,500 homes or a mix of the two, together with appropriate provision of other uses such as local shops, leisure facilities and schools. These areas generally include major brownfield sites with capacity for new development and places with potential for significant increases in density. Their development should be geared to the use of public transport and they are either located at areas of good access or would require public transport improvements to support development.

The very location and nature of the BXC site means that the proposed development is intrinsically environmentally sustainable in a number of respects. The entire site comprises brownfield land and is located in close proximity to existing public transport nodes including Brent Cross London Underground station, Cricklewood over ground railway station and the bus interchange at Brent Cross Shopping Centre.

2.2 Barnet Unitary Development Plan

The London Borough of Barnet has placed sustainable development at the heart of its planning policies, as expressed in its Unitary Development Plan, adopted in May 2006. Policy GSD identifies this commitment among its guiding principles, and also indicates how providing mixed use development can help ensure sustainable development.

Barnet Unitary Development Plan (Adopted May 2006)

Chapter 2 – Part 1 - Strategic Policies

"2.3 Guiding Principles

2.3.1 The principles that will guide development in the borough throughout the plan period are as follows:

i. To plan for sustainable development:

- to ensure that planning decisions are made in accordance with the principles of sustainable development.

The meaning of sustainable development used by the council is meeting the essential needs of people today without destroying the environment for future generations who will depend on it to meet their own needs. However, policies in development plans should complement the land - use planning aspects of sustainable development and must be capable of being addressed through the land use planning system."

. . .

"2.3.2 The UDP will ensure that planning decisions are made in accordance with the principles of sustainable development, particularly the need to encourage development that provides opportunities, services and prosperity today which continues for future generations. Policies contained within the UDP will encourage a more efficient re-use of land; protection of natural resources including the Green Belt; preservation or enhancement of the built environment; and the development of well-connected, higher-density, mixed use schemes in appropriate locations which reduce the need to travel to jobs, shops and other services. The Council adopted the 'Three Strands Approach' (November 2004) to protect the Green Belt and suburbs, whilst addressing the demands for additional housing accommodation within the borough. This council policy aligns with the UDP."

"2.4 Strategic Policies

2.4.1 One overall theme to run through the whole plan is that of sustainable development. Sustainable development does not apply simply to one particular area of planning and as such should be a theme running through the whole plan. Planning can positively promote more sustainable forms of development through locating development close to the public transport network in order to reduce the need to travel by car, using brownfield sites where possible for new development, protecting areas of high landscape and species value and minimising pollution. The Council is committed to ensuring that planning decisions are made in accordance with principles of sustainable development.

Strategic Policy GSD Sustainable Development

The council will seek to ensure that the development and growth within the borough is sustainable"

2.4.2 To facilitate many of the aims of the Plan the council will promote mixed use developments. Mixed use developments can help to create attractive places for people to live,

work and relax in one area. Such developments can contribute to the aims of sustainable development through reducing the need to travel, encouraging the use of public transport, maximising the efficiency of land, adding to the vitality of areas, offering opportunities for energy saving and creating a safer environment for communities.

Strategic Policy GMixed Use

The Council will encourage development proposals which incorporate a mix of uses within buildings or areas in town centres and other appropriate locations. When considering mixed uses the council will take account of:

- the character and diversity of the existing area;
- the feasibility of a second use given the nature of the first use and the site characteristics;
- any potential nuisance to other users; and
- the accessibility of the site by a range of modes of transport."

The need for the regeneration of BXC has long been recognised. Indeed this need is reflected in the adopted UDP through Policy GCrick which identifies the area as a major development opportunity to which sustainable development forms a core principle as set out in Policy C4.

Barnet Unitary Development Plan (Adopted May 2006)

Strategic Policy GCrick

"The Cricklewood, Brent Cross and West Hendon Regeneration Area, as defined on the proposals map, will be a major focus for the creation of new jobs and homes, building upon the area's strategic location and its key rail facilities. All new development will be built to the highest standards of design as well as to the highest environmental standards. A new town centre, developed over the plan period, will be fully integrated into the regeneration scheme."

Policy C4 Sustainable Development

"The council will seek to ensure that the redevelopment of the Regeneration Area pursues the highest standards of environmental design. Development should:

A) Meet high performance standards of environmental design and construction;

B) Create an integrated network of open spaces and pedestrian and cycle routes to meet leisure, access, urban design and ecological needs both within the Regeneration Area and through enhanced connections to the surrounding area;

C) Ensures the restoration and enhancement of the river Brent and its river corridor to provide both amenity and nature conservation to the area.

Development which would be directly or indirectly detrimental to

the nature conservation value of the site of special scientific interest will not be permitted. Development proposals must also ensure that:

• There is an adequate buffer zone

• Appropriate protection is afforded to legally protected species; and

• Opportunities are taken to enhance the biodiversity of the area."

The link between sustainable development and regeneration of BXC is clarified in the explanatory text to Policy C4.

Barnet Unitary Development Plan (Adopted May 2006)

Commentary on Policy C4 Sustainable Development (Excerpts)

"The regeneration of the area will provide the opportunity to apply the highest standards of environmental sustainability. This means that environmental resources, including land, materials, energy and water are used efficiently and effectively, that pollution is minimised so as to protect the environment and that biodiversity is protected and improved."

"The development must therefore include an appropriate mix of uses that makes the best use of the site and its location, reduces the need to travel and is sustainable in the future. The opportunity to make use of rail freight is of particular significance in terms of environmental sustainability . . . "

"The large increase in jobs, shops and housing in the area will lead to significant improvements to the social and economic sustainability of the area but will also have a severe impact on the transport infrastructure. In order to be more environmentally sustainable in transport terms, development must reduce the negative impact of additional travel. This can be achieved through detailed planning, for example, in the mix of uses, car parking policy and through maximising accessibility by public transport, bicycle and on foot. Proposals will need to demonstrate that there are safe and convenient transport connections, particularly for pedestrians, cyclists and buses both within the Regeneration Area and to connect with the surroundings, and that these routes are clearly delineated.

The council will expect development to meet high performance standards for environmentally sustainable design and construction, covering energy efficiency, passive solar design, use of renewable energy, waste handling, the use of recycled building materials and sustainable urban drainage."

2.3 Supplementary Planning Guidance - Cricklewood, Brent Cross and West Hendon Regeneration Area: Development Framework (December 2005)

The suitability of the development of the BXC area is reinforced through the adoption of a Development Framework in December 2005. The Framework sets out strategic principles that should be followed when addressing the many needs of the area. These included land use mix, street hierarchy, building scale and density, residential type and density, open space and public realm, and sustainable development. Particular attention is given in the Framework to potential for a considerable improvement and expansion of public transport as one of the major means by which the area could be regenerated. Not only would such an expansion generate the necessary vitality to create a sustainable community and town centre, it would also contribute significantly to reducing the need for residents in this area of London to commute long distances to work, and hence help reduce exhaust emissions from private cars. The regeneration of the Brent Cross Cricklewood area offers a unique opportunity to improve the quality of life for residents and users. The present application is a direct response to the Development Framework.

Development Framework for the Cricklewood, Brent Cross and West Hendon Regeneration Area

Sustainable Development (Page 40)

All buildings will be required to incorporate a range of best practice energy saving and environmental features, drawing on technologies and techniques that promote sustainable development. As building continues over the period of the Development Framework, best practice standards will be reviewed and enhanced. Buildings should positively address the following design issues:

- orientation and use of solar layout for housing
- orientation and design to increase daylight provision in offices
- south facing roof orientation to maximise solar gain
- utilise opportunities for natural ventilation
- ensure all new commercial premises attain a BREEAM rating of 'very good' including energy use, low water use, pollution, health and the use of materials, with an aspiration to achieve an excellent rating
- ensure all new dwellings attain an EcoHomes rating of 'very good' and a National Home Energy Rating of 10, with an aspiration to achieve an excellent rating
- pressurisation testing on new building types to limit heat loss
- where possible use locally sourced and recycled materials

The Council will expect developers to investigate the opportunities to implement Combined Heat and Power systems.

Proposals for development will need to show how sustainability principles will be met in terms of demolition, construction and long-term management.

All properties and especially those with front doors directly on to the street must be capable of accommodating provision for the storage and sorting of recyclables by residents and suitable access for collection by vehicles, including domestic refuse.

The highest quality of building design will be required to ensure best practice in construction and demolition, sustainability and energy efficiency. New buildings will significantly improve upon traditional standards in terms of comfort, utility and running costs.

The SPG identifies a number of environmental constraints in the development area, in particular:

- The historic industrial development in the area has left a significant level of contamination. These areas are located along the railway line and include a former gas works and rail related contamination. These contamination areas obviously pose a constraint to development and remediation of the sites will be necessary. The northern part of the Cricklewood Railway Lands has historically been used as an unlicensed dump.
- The other prime environmental constraints are due to noise and air pollution. Given the level of infrastructure on or around the regeneration area, including the busy highway network, certain areas experience high levels of noise pollution and air quality. These issues will inform the location of new development and the distribution of land uses.

The SPG also identifies the opportunity for the sustainable disposal of waste:

- A new waste handling facility will be provided. The facility will be railway linked and will provide opportunities for the sustainable disposal of waste.

2.4 Planning policy concerning Environmental Sustainability

The planning policies of both the London Borough of Barnet and the Greater London Authority include a number of strategic and detailed policies requiring that the adverse effects of development on the environment shall be reduced. Two main types of effect are addressed:

- impact on the environment, including global effects such as depletion of the ozone layer, and contributing to climate change by emission of “greenhouse” gases, and local effects such as pollution of air and water and adverse noise and microclimate effects;
- reducing the use of non-renewable resources including, especially, minerals, water, fossil fuels and greenfield land.

The proposals for BXC have been developed to address environmental sustainability planning policies at National, Regional and Local Government level. The key drivers at these three levels have been:

- UK Government’s Planning Policy Statement PPS1 “Delivering Sustainable Development” (ODPM, 2005);
- Planning and Climate Change. Supplement to Planning Policy Statement 1 (December 2006)
- the Mayor’s London Plan Consolidated with Alterations since 2004 (February 2008);
- the London Plan Supplementary Planning Guidance on “Sustainable Design and Construction” (May 2006);
- the London Borough of Barnet’s Unitary Development Plan (adopted May 2006);
- Supplementary Planning Guidance “Cricklewood, Brent Cross and West Hendon Regeneration Area Development Framework” (December 2005), and
- Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006)

These policies are discussed further in the next Section and key policies are listed in Appendices A-D, Chapters 11-14.

Two overarching policies address the need for environmental responsibility concerning design and construction:

- the London Borough of Barnet's strategic policy GBEnv2 Environmentally friendly construction, and
- the GLA's Policy 4A.3 in the Mayor's London Plan - Sustainable design and construction.

2.4.1 The London Borough of Barnet's Strategic Policy GBEnv2 Environmentally friendly construction

GBEnv2 is the overarching policy addressing the need for environmentally responsible design and construction:

> Barnet Strategic Policy GBEnv2 Environmentally friendly construction
>
> The council will require high quality design in all new development in order to enhance the quality of the built and open environment, to utilise environmentally friendly methods of construction, to improve amenity for residents, to encourage investment in the local economy and help meet the council's objectives of sustainable development and ensuring community safety.

2.4.2 The GLA's Supplementary Planning Guidance on Sustainable Design & and Construction

The purpose of the London Plan Supplementary Planning Guidance on "Sustainable Design and Construction" (GLA, 2006) is to provide the means of implementing Policy 4A.3 "Sustainable Design and Construction" in the London Plan Consolidated with Alterations since 2004 (February 2008).

> **Policy 4A.3 Sustainable design and construction**
>
> The Mayor will, and boroughs should, ensure future developments meet the highest standards of sustainable design and construction and reflect this principle in DPD policies. These will include measures to:
>
> - make most effective use of land and existing buildings
> - reduce carbon dioxide and other emissions that contribute to climate change
> - design new buildings for flexible use throughout their lifetime
> - avoid internal overheating and excessive heat generation
> - make most effective and sustainable use of water, aggregates and other resources
> - minimise energy use, including by passive solar design, natural ventilation, and vegetation on buildings
> - supply energy efficiently and incorporate decentralised energy systems (Policy 4A.6), and use renewable energy where feasible (Policy 4A.7)
> - minimise light lost to the sky, particularly from street lights
> - procure materials sustainably using local suppliers wherever possible
> - ensure designs make the most of natural systems both within and around the building
> - reduce air and water pollution
> - manage flood risk, including through sustainable drainage systems (SUDS) and flood resilient design for infrastructure and property
> - ensure developments are comfortable and secure for users
> - conserve and enhance the natural environment, particularly in relation to biodiversity, and enable easy access to open spaces

- avoid creation of adverse local climatic conditions
- promote sustainable waste behaviour in new and existing developments, including support for local integrated recycling schemes, CHP and CCHP schemes and other treatment options
- encourage major developments to incorporate living roofs and walls where feasible (Policy 4A.11)
- reduce adverse noise impacts.

The Mayor will and the boroughs should require all applications for major developments to include a statement on the potential implications of the development on sustainable design and construction principles. This statement should address demolition, construction and long-term management. Boroughs should ensure that the same sustainability principles are used to assess other planning applications.

The Mayor will and boroughs should ensure that developments minimise the use of new aggregates and do not use insulating and other materials containing substances which contribute to climate change through ozone depletion.

Developers should use best practice and appropriate mitigation measures to reduce the environmental impact of demolition and construction.

The SPG requires that an Environmental Sustainability Strategy be submitted with planning applications illustrating how the proposed development will comply with the policy. The measures for achieving high standards of sustainable design and construction are addressed under two main headings, and seven subheadings, as follows.

Sustainable Design:

- Reuse of land and buildings
- Maximise the use of natural systems
- Conserve energy, materials and water resources
- Reduce impacts of noise, pollution, flooding and microclimate effects
- Ensure developments are comfortable and secure
- Conserve and enhance the natural environment and biodiversity, and
- Promoting sustainable waste behaviour.

Sustainable Construction.

Under each of these headings the SPG indicates a number of Essential Standards that apply to all major developments in London. It also suggests a number of additional standards – the Mayor's Preferred Standards – that indicate more exemplary approaches that can be followed, but which do not yet have the status of adopted policy.

The response by the Development Partners to these environmental sustainability standards is set out in the next chapter.

3 The Development Partners' proposals for Environmental Sustainability

3.1 Introduction

Environmental sustainability has been incorporated into the BXC application not only to respond to the appropriate planning policies, but also at the express wish of the Development Partners who are committed, in their commercial activities, to minimising the impact of their operations on the environment. The Development Partners for BXC are fully committed to ensuring environmental sustainability forms a central thread running through every aspect of the proposed development. In order to ensure the various policies relating to environmental sustainability will be met, a series of Environmental Sustainability Objectives have been set. These are given on the following pages.

These objectives have formed the basis for the Environmental Sustainability Strategy at BXC. The remaining chapters of this document describe and explain the components of this strategy, however, the final part of this chapter summarises how the scheme responds to the standards set out in the Mayor's Supplementary Planning guidance on Sustainable design and construction.

Environmental Sustainability Objectives

Water

Consumption of water will be reduced to protect local water supplies. As appropriate, this will involve both water resources management techniques and technologies such as rainwater use (for irrigation) and use of equipment with low water consumption.

Objectives

- Conserve supplies of potable water.
- Maximize the efficiency of water use.
- Ensure the quality of ground, fluvial and sea water are not adversely affected.
- Avoid or minimize adverse effects of flooding and storm run-off water.

Global Atmospheric Impacts and Local Air Quality

The development will address the causes of global climate change by minimising emissions of greenhouse gases and air pollution. This will be achieved by the implementation of best practice design, operation and maintenance strategies.

Objectives

- Reduce greenhouse gas emissions contributing to global climate change.
- Reduce air pollution through direct causes (e.g. boiler emissions) and ensure air quality continues to improve through the longer term.
- As far as possible, minimize impacts on air quality due to indirect causes, e.g. vehicle emissions.

Energy

Sustainable design techniques will be utilised to deliver a development that will enable individual buildings to be designed that meet or exceed current best-practice energy-efficient performance standards. The potential for energy generation from renewable sources on-site will be addressed.

Objectives

- Minimise energy demand and reduce consumption
- Reduce use of non-renewable energy sources
- Maximize energy efficiency in buildings.
- Maximize use of alternative sustainable energy sources

Outdoor Environments

A healthy outdoor environment will be provided by ensuring good air quality and low pollution levels, good acoustic, natural lighting and ventilation, and good external microclimate, light and shade, and no adverse effects of wind.

Objectives

- Enhance local microclimate and comfort outside buildings e.g. using shading and humidification.
- Ensure high quality acoustic performance outside buildings.
- Provide a high-quality lighting environment and maximize use of natural light.

Continued . . .

Environmental Sustainability Objectives (cont.)

Indoor Environment

A healthy indoor environment will be provided by ensuring good internal air quality and low pollution levels, good acoustic, natural lighting and ventilation, and good light and shade.

Objectives

- Enhance comfort, well-being and air quality inside buildings through climatic control.
- Ensure high quality acoustic performance within buildings.
- Create healthy indoor environments free from harmful materials.

Land Use and Ecology

Pedestrian routes and open spaces will be designed to minimize impediments to movement and to improve accessibility to facilities. Public areas will take into consideration the needs of people with disabilities or impaired mobility by designing for maximum flexibility to meet varying needs. The development will enhance the local ecology within the development.

Objectives

- Use sensitive landscaping to enhance the landscape and create biodiversity and habitats for key species of flora/fauna.
- Provide networks of open space for the benefit of people and flora and fauna.
- Promote connectivity and the movement of people within the development and ensure accessibility for all people to the development and its facilities.
- Prevent contamination of land, and undertake remediation using sustainable methods.

Materials and Waste

The environmental impact caused by using materials shall be minimized and managed efficiently. Minimize the extraction of new materials. Minimize the environmental impact from waste.

Objectives

- Minimize the quantities of materials used and avoid use of scarce materials.
- Use materials with low embodied energy wherever possible.
- Avoid using materials that have adverse impacts on people or the environment.
- Use recycled materials, and materials capable of being recycled, wherever possible.
- Avoid and reduce the production of waste, both during construction and operation of the facilities.
- Reduce waste sent to landfill by recycling

3.2 Meeting the GLA's Standards for Sustainable Design and Construction

The following two sections summarize the BXC Development Partners' proposals respond to the GLA's standards for Sustainable Design and Construction.

3.2.1 Meeting the GLA's "Essential Standards" for Sustainable Design and Construction

The development proposals at BXC will meet virtually all 42 the "Essential Standards" set out in the GLA's SPG "Sustainable Design and Construction" (2006). The table below summarizes how each of these standards will be achieved.

Note: References in the following table refer to the London Plan (2004). The SPG has not yet been updated to embrace the alterations in The London Plan: Consolidated with Alterations since 2004 (February 2008).

SPG Section	Essential standards set out in the Mayor's SPG Sustainable Design and Construction (2006)	BRENT CROSS CRICKLEWOOD
Sustainable Design: Reuse of land and buildings		
Land 2.1.2	100% of development on previously developed land, unless very special circumstances can be demonstrated	The entire proposed development at BXC will be built on previously developed land.
	Development density should be maximised based on local context (Policy 4B.7) design principles (Policy 4B.1) open space provision (Policy 3D.10) and public transport capacity (Policy 3D.10). Residential development will be assessed on the Matrix of Sustainable Residential Density in the London Plan (Table 4B.1).	The proposed development, comprising retail, residential, commercial offices and hotels, has been designed with regard to the local context and design principles set out in the stated policies. The development proposals include a major improvement to the public transport network by providing new stations, new bus links, improved interchanges and better access to transport nodes. Further detail is provided in the Design & Access Statement.
Buildings 2.1.3	Existing building are reused where practicable, where the density of development and residential amenity are optimised and where the building conforms or has the potential to meet the standards for energy, materials, biodiversity and water conservation set out in this SPG	The retail centre at Brent Cross is being retained and extended. The majority of buildings south of the North Circular Road are unsuitable or impractical for refurbishment or reuse as a means of delivering the planned regeneration of this area.

Sustainable Design: Maximise the use of natural systems		
Location and urban design 2.2.2	All development to follow the principles of good design set out in London Plan policy 4B.1	The site has been designed with regard to Policy 4B.1: Principles of design for a compact city. In particular, it will maximise the potential of the site, provide a mix of uses and be accessible for all users. This is set out in more detail in the Design & Access Statement.
	Minimise need for and use of mechanical ventilation, heating and cooling systems	Mechanical ventilation, heating and cooling systems will only be used where this is necessary to serve the buildings' functions. Natural ventilation will be used wherever this suits the building functionality, and while taking account of the need to provide protection against ingress of external noise and low-quality air.
Adapting to Climate Change 2.2.3	Buildings provide for flexibility of uses during their projected operational lives	The commercial buildings will have large bay sizes allowing for alternative internal layouts, and their construction will be such that new stairs, services course and lifts can be inserted at later dates to suit new uses of the buildings. The retail buildings will be constructed in ways that will allow refitting to suit a variety of potential occupants.
	Buildings adapt to and mitigate for the effects of the urban heat island and the expected increases in hot dry summers and wet mild winters	Buildings will be designed to minimise the consequences of climate change, including passive cooling methods and the use of façades to reduce solar gain, as appropriate.
	Design in facilities for bicycles and electric vehicles	Facilities for cyclists will be provided in residential and commercial buildings and a network of cycle routes will be provided throughout the development site. It will be possible to install and operate facilities for electric cars (e.g. charging points) when the demand for them arises. Further details are given in Section 5 of the Design & Access Statement.

Sustainable Design: Conserve energy, materials and water resources		
Energy 2.3.2	Carry out an energy demand assessment	An Energy Strategy and Assessment has been produced to support this application. This includes an assessment of energy demand and details of how this demand can be minimised.
	Maximise energy efficiency	This will be achieved by minimising demand for energy, using energy as efficiently as possible, for example by use of energy-efficient lighting and heat recovery, and maximising the efficiency of its generation and distribution. Networks for distributing heat via pipes will minimise the distances involved and use insulation to reduce heat losses in transmission.
	Major commercial and residential developments to demonstrate that consideration has been given to the following ranking method for heating and where necessary cooling systems: - Passive design - Solar water heating; then - Combined heat and power for heating and cooling (i.e.trigeneration) , preferably fuelled by renewables; then - Community heating and cooling; then - Heat pumps; and then - Gas condensing boilers.	The suggested hierarchical approach has been followed and will be continued as each phase of the development is progressed. Further details are provided in the Energy Strategy and Assessment. A major energy initiative is proposed for the generation of electricity and heat to supply a community heating scheme by means of the thermal treatment of the waste that remains after materials suitable for recycling have been removed.
	Wherever on-site outdoor lighting is proposed as part of a development it should be energy efficient, minimising light lost to sky.	This will be achieved and further details will be proposed at the detail design stage.
	Carbon emissions from the total energy needs (heat, cooling and power) of the development should be reduced by at least 10% by the on-site generation of renewable energy.	This document includes a commitment to reduce the carbon dioxide emissions of residential buildings by at least 44%, and non-residential buildings by at least 20% below Building Regulations 2006, partly through the use of energy from renewable sources. If the Energy from-Waste facility is realised, the scheme will achieve a reduction of carbon dioxide emissions close to 60%.
Materials 2.3.3	50% timber and timber products from Forest Stewardship Council (FSC) source and balance from a known temperate source	This document includes a commitment to use 90% of timber products from FSC, where possible.

Deleted: energy needs of the development by at least 10% using

Deleted: The Energy Strategy and Assessment Report (BXC9) indicatively demonstrates how carbon dioxide emissions from the development will be reduced by at least 10% by the on-site generation of renewable energy.

	Insulation materials containing substances known to contribute to stratospheric ozone depletion or with the potential to contribute to global warming must not be used	No materials proscribed in the Montreal Protocol will be used in the construction or fit-out of buildings. In particular, refrigerants and insulation materials will have zero Ozone Depletion Potential (ODP). Insulation materials will have as low a Global Warming Potential (GWP) as possible, subject to their availability and commercial constraints.
	Minimize use of new aggregates	Wherever possible, especially for fill, landscaping and in low-strength concretes, recycled crushed aggregates (RCA) will be used.
	Specify use of reused or recycled construction materials. From 2.7.2 (Waste)	This will be done where there are viable choices that suite the building functionality. An assessment of recycled content will be undertaken using the Waste and Resources Action Plan (WRAP) Recycled-Content toolkit. All construction will be required to have a recycled content of at least 10% by value. [The use of recycled materials is also mentioned under "Waste" in 2.7.2 below].
Water 2.3.4	Residential developments to achieve average water use in new dwellings of less than 40m³ per bedspace per year (approximately 110 litres/head/day)	Residential buildings will achieve water use of 105 litres/person/day (38.3 cubic metres per year). In residential buildings dual-flush toilets, showers and spray taps will be specified. When specified by developers, white goods will be A-rated for energy and water use. Beyond these measures, actual water use is largely determined by residents. Reduced water use will be encouraged by the installation of water meters.
	100% metering of all newly built property	Water metering will be incorporated that will allow water use to be monitored and leaks or dripping taps to be identified as soon as they occur.

Sustainable Design: Reduce impacts of noise, pollution, flooding and microclimate effects		
Noise 2.4.2	Demonstrate that adverse impacts of noise have been minimised, using measures at source or between source and receptor (including choice and location of plant or method, layout, screening and sound absorption) in preference to sound insulation at the receptor, wherever practicable	This document identifies various noise standards that will be achieved at detail design stages. Assessment is provided within the Environmental Statement that accompanies the planning application.
Air Pollution 2.4.3	All new gas boilers should produce low levels of NOx	Any gas boilers used to deliver heat will have NOx emissions of less than 70 mg/kWh at 0% excess oxygen.
	Take measures to reduce and mitigate exposure to air pollution	This document identifies various air quality standards that will be achieved at detail design stages. Assessment is provided within the Environmental Statement that accompanies the planning application.
Water Pollution and Flooding 2.4.4	Use Sustainable Drainage Systems (SDS) measures, wherever practical	This document commits to the use of Sustainable Urban Drainage Systems which will be defined at a detailed design stage. Examples are provided within the Drainage Strategy (BXC15) which accompanies the planning application.
	Achieve 50% attenuation of the undeveloped site's surface water run off at peak times	With the agreement of the Environment Agency, a 25% attenuation of the undeveloped site's surface water run off at peak times will be achieved. The Drainage Strategy (BXC15), which accompanies the planning application, provides indicative details.
Microclimate 2.4.5	Mitigate any negative impact on the microclimate of existing surrounding public realm and buildings to meet the Lawson criteria for wind comfort and safety	This document identifies various microclimate standards that will be achieved at a detail design stage. Assessment is provided within the Environmental Statement that accompanies the planning application.

Sustainable Design: Ensure developments are comfortable and secure		
Indoor comfort 2.5.2	Inert and low emission finishes, construction materials, carpets and furnishings should be used wherever practical.	Inert and low emission materials will be used throughout the development wherever practical.
	All plant and machinery should be accessible for easy maintenance	All plant and machinery will be accessible for easy maintenance

Designing inclusive environments 2.5.3	All developments should meet the principles of inclusive design, adopting the principles of SPG "Accessible London: Achieving an Inclusive Environment".	The development will meet the principles of inclusive design, where possible. Further details are to be found in the Design & Access Statement (BXC 3).
	All residential development should meet Lifetime Home standards and 10% should meet wheelchair accessibility standards (London Plan Policy 3A.4)	The Development Partners will apply and meet the requirements of 'Lifetime Homes' standards, as defined by the Habinteg (Appendix 6 of this document), to all new residential buildings, to the extent that this is consistent with the high density, mixed use masterplan and the terms of an outline planning permission. In such instances where one or more standards cannot be achieved on any units, the reasons shall be highlighted and explained to the LPA prior to those works commencing on site. 10% of residential units will meet wheelchair accessibility standards.
Secure design 2.5.4	Developments should incorporate principles of "Secured by design".	The development incorporates the principles of "Secured by design", as set out in the Design & Access Statement.

Sustainable Design: Conserve and enhance the natural environment and biodiversity		
Open space 2.6.2	No net loss of publicly accessible open space	There will be no net loss of publicly accessible open space.
	Create appropriate new open, green, publicly accessible spaces where these can redress identified areas of deficiency of public open space	The proposed development provides a range of new and upgraded public open spaces in order to address the deficiencies identified in LBB Open Space Strategy for Cricklewood, Brent & West Hendon Regeneration Area, December 2005. Details are provided in Parameter Plan 003.
Natural environment and biodiversity 2.6.3	No net loss of biodiversity and access to nature on the development site	The proposal will provide new landscaped areas on site that will enhance biodiversity and represent a significant improvement when compared to the existing site situation. Four new nature parks will be provided, as well as a comprehensive network of habitat rich green corridors across the development area. Details are provided in Parameter Plan 003.
	Reduction in areas of deficiency in access to nature	See above.

Sustainable Design: Promoting sustainable waste behaviour		
Waste 2.7.2	Minimise, reuse and recycle demolition waste on site where practical	A number of buildings on the site need to be demolished in order to allow the full regeneration potential of the site to be realised. Demolition is to be carried out in accordance with the ICE Demolition Protocol.
	Specify use of reused or recycled construction materials	This will be done where there are viable choices that suite the building functionality. An assessment of recycled content will be undertaken using the WRAP Recycled-Content toolkit. All construction will be required to have a recycled content of at least 10% by value. [The use of recycled materials is also mentioned under "Materials" in 2.3.3 above].
	Provide facilities to recycle or compost at least 25% of household waste by means of separated dedicated storage space. By 2010 this should rise to 35%.	Residential buildings will be provided with separated dedicated storage space to facilitate recycling and composting of at least 40% of household waste.
	Recycling facilities should be as easy to access as waste facilities	All waste handling areas will be provided with storage space for recyclables, organics and residual wastes.

Sustainable Construction		
Construction 3.2	Reduce waste during construction and demolition phases and sort waste stream on site where practical	Contractors will be required to develop and implement a Site Waste Management Plan that will help ensure that generation of waste on site is minimised and that, when produced, waste streams will be sorted on site wherever practical.
	Reduce the risk of statutory nuisance to neighbouring properties as much as possible through site management	This will be achieved. Details are set out in the Code of Construction Practice (CoCP).
	All developers should consider and comply with the Mayor and ALG's London BPG on the control of dust and emissions during construction and demolition	Details are set out in the CoCP.
	Comply with protected species legislation	This will be achieved. Details are set out in the CoCP.
	All developers should sign up to the relevant Considerate Constructors Scheme or in the City of London to the Considerate Contractor scheme	Throughout the phased construction of the development all construction sites will be registered under the Considerate Constructors Scheme.

3.2.2 Meeting the "Mayor's Preferred Standards" for Sustainable Design and Construction

The development proposals at BXC will meet, wholly or in part, the majority of the 28 "Preferred Standards" set out in the GLA's SPG "Sustainable Design and Construction" (2006). The table below summarizes how the standards will be achieved and explains why it will not be practical to meet some of them.

SPG Section	Mayor's preferred standards set out in the Mayor's SPG Sustainable Design and Construction (2006)	BRENT CROSS CRICKLEWOOD
Sustainable Design: Reuse of land and buildings		
Land 2.1.2	None	N/A
Buildings 2.1.3	Existing roof space is reused where practicable to create new outdoor spaces and enhance biodiversity alongside the integration of renewable energy (section 2.3.2)	Not possible for existing buildings, the majority of which are demolished. 10% of the available area on new construction will have a green or brown roof. The opportunities for using the roof space on new buildings to locate renewable energy generation equipment will be fully studied at a detail design stage.

Sustainable Design: Maximise the use of natural systems		
Location and urban design 2.2.2	None	N/A
Adapting to Climate Change 2.2.3	None	N/A

Sustainable Design: Conserve energy, materials and water resources		
Energy 2.3.2	All developments to demonstrate that consideration has been given to the following ranking method for heating and where necessary for cooling systems and should incorporate the highest feasible of the following options: - solar water heating; then - combined heat and power/trigeneration, preferably fuelled by renewables; then - community heating. New developments should always be connected to existing community heating networks preferably fuelled by renewables where feasible	This document identifies the key energy commitments in the scheme, which include the use of CHP. The Energy Strategy and Assessment Report (BXC 9).which supports the application, identifies the approach to the ranking system.
	Wherever outdoor lighting or other electrically powered street furniture is proposed on site, it should be solar powered and minimise light lost to the sky	Details will be considered at a detailed design stage.
	Lighting, heating and cooling controls should enable services to operate efficiently under different loadings and allow for localised control	These control measures will be incorporated in commercial buildings.
	Major developments should be zero carbon emission developments (ZEDs).	It will not be technically or commercially viable for the entire development at BXC to be a ZED. The infrastructure and individual buildings will be designed to allow the easy installation of alternative means of energy generation with zero carbon dioxide emissions when such technologies become viable. The measures proposed, including fuelling the CHP plant with a refuse derived fuel will reduce carbon dioxide emissions, estimated with 2006 benchmarks, by an estimated 50-60%. This equates to an annual reduction of over 10,800 tonnes of carbon dioxide. Based on estimates of the carbon footprint, this would be equivalent to planting and maintaining around 15,000 trees per annum, for 100 years.
	Major developments should make a contribution to London's hydrogen economy through the adoption of hydrogen and/or fuel cell technologies and infrastructure	The infrastructure and individual buildings will be designed to allow the easy installation of hydrogen / fuel cell technologies when they become viable. Opportunities for implementing these measures are addressed in the Energy Strategy and Assessment .

Materials 2.3.3	No construction nor specification of material with high embodied impact to be used (as defined by the summary ratings in the Green Guide to specification) unless a compelling whole life energy or technical case for its use exists.	All materials used for the construction and fitting out of the buildings will be selected from the A+, A, B or C rated options given in "The Green Guide to Specification", published by the BRE (2009).
	90% structural timber from FSC source and the balance of timber products from a known temperate source	This will be achieved.
	No peat or natural weathered limestone used in buildings or landscaping	Use of peat-free compost shall be specified at detail design stage. Use of natural weathered limestone shall be excluded at detail design stage.
	Before demolition, appraisal of maximising recycling of materials by use of ICE's Demolition Protocol	The buildings to be demolished will be appraised to identify the maximum opportunities for recycling of materials. Subject to discussions with contractors, it is the intention that this will be undertaken using the ICE's Demolition Protocol.
	50% of construction materials by mass used in the development to be sourced from a factory/plant, quarry, wharf, railhead or recycling centre within 35 miles of site wherever feasible	Construction materials will be sourced from as near to the site as feasible. It is not expected that 50% will be found within 35 miles of the site.
	10% total value of materials used to be derived from recycled and reused content in products and materials selected	This target will be met. The 10% recycled and reused content will be verified using the toolkit developed by the Waste and Resources Action Plan (WRAP)
Water 2.3.4	Residential developments to achieve average water use in new dwellings of less than 25m³ per bedspace per year (approximately 70 litres/head/day)	Residential buildings will achieve water use of 105 litres/person/day (38.3 cubic metres per year) and thus this standard will not be achieved. However, residential developments will be fitted with water meters and low-water use appliances and fittings throughout, including dual-flush toilets, showers and spray taps. When specified by developers, white goods will be A-rated for energy and water use. Beyond these measures, actual water use is largely determined by residents.
	Use of grey water for all non potable uses	10% of rainwater will be collected and used to provide all the irrigation water needed for the development. Grey water from commercial / office premises will be reused.

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Sustainable Design: Reduce impacts of noise, pollution, flooding and microclimate effects		
Noise 2.4.2	For residential development achieve BS 8233:1999 (Table 5) 'good' standards for external to internal noise and improve on Building Regulations (2003) Part E for internal sound transmission standards by 5dB (See Ecohomes)	This performance target will be met, as set out in Section 2 of this document.
Air Pollution 2.4.3	Low emission developments that are designed to minimize the air quality impact of plant, vehicles and other sources over the lifetime of the development	This will be achieved. Details area provided within Section 2 of this document. Assessment of air quality is provided within the Environmental Statement.
Water Pollution and Flooding 2.4.4	Achieve 100% attenuation of the undeveloped site's surface water run off at peak times	25% attenuation of the undeveloped site's surface water run off at peak times will be achieved. This has been developed and agreed with the Environment Agency.
Microclimate 2.4.5	None	

Sustainable Design: Ensure developments are comfortable and secure		
Indoor comfort 2.5.2	Design buildings for indoor comfort of users	The building interiors in the all buildings will be designed to provide maximum comfort appropriate to their use and their commercial context.
Designing inclusive environments 2.5.3	All residential development should be designed to meet wheelchair accessibility standards or be easily adaptable to meet wheelchair standards	This standard will not be met. 10% of residential units will be designed to meet wheelchair accessibility standards. Full details are given in the Design & Access Statement (BXC 3).
	Developments should be fully e-enabled.	All buildings will be connected to a high-capacity network.
Secure design 2.5.4	None	N/A

Sustainable Design: Conserve and enhance the natural environment and biodiversity		
Open space 2.6.2	Net gain of publicly accessible open space	There will be a net gain of publicly accessible open space.
Natural environment and biodiversity 2.6.3	Net gain of biodiversity and access to nature on the development site	There will be a net gain of biodiversity and access to nature on the development site. Details are provided on Parameter Plan 003.

Sustainable Design: Promoting sustainable waste behaviour		
Waste 2.7.2	Use prefabricated and standardised modulation components to minimise waste. If this is not feasible use low waste fabrication techniques	This will be achieved wherever such components are available and suite the buildings being constructed.
	Provide facilities to recycle or compost at least 35% of household waste. By 2015 this should rise to 60%.	Recycling facilities will be provided and plans for achieving the targets will be developed in discussions with the waste collection contractors. Facilities to achieve a minimum 40% recycling/composting rate will be provided however this will not preclude the ability to achieve higher recycling / composting performance If commercially viable, it is planned to install an underground vacuum collection system` for waste collection (e.g. the ENVAC System) that will significantly raise the proportion of waste recycled or composted. Furthermore, a waste handling facility is planned as part of the development; this facility will enable additional recyclable materials to be recovered from the waste stream. The combination of source segregated recycling and waste recovery at the waste handling facility will achieve greater than 85% diversion of waste from landfill
	Provide facilities to recycle 70% of commercial and industrial waste by 2020.	It is expected that the target of achieving 70% recycling by 2020 will be met by a variety of means including the potential use of an underground vacuum powered waste collection system.

	Incorporation of or access to new waste recovery facilities (anaerobic digestion, pyrolysis/gasification) especially to provide a renewable source of energy eg. methane or hydrogen	Opportunities for incorporating innovative waste recovery facilities are being studied and will be included in the application.

Sustainable Construction		
Construction 3.2	All contractors should be required by tender requirements to sign up to the Mayor and ALG's London BPG on the control of dust and emissions during construction and demolition	Contractors shall be required by tender requirements to sign up to the Mayor and ALG's London BPG on the control of dust and emissions during construction and demolition. Further details are given in the CoCP.
	All contractors should be required by tender requirements to sign up to the relevant Considerate Constructors Scheme or in the City of London to the Considerate Contractor scheme	Contractors shall register construction sites under the Considerate Constructors Scheme.

4 Materials Resource Efficiency Strategy

4.1 Introduction

The BXC Development Partners are committed to delivering a scheme that addresses the environmental issues associated with the handling and use of materials. The Materials Resource Efficiency Strategy has been developed to illustrate and clarify these commitments. To ensure that the proposals will achieve best practice standards, the strategy has been developed in collaboration with the Waste Resources and Action Programme (WRAP) who will continue to be involved as development progresses.

A study has been undertaken of the issues regarding goods and materials arising from demolition, construction waste, and materials used in new construction for the development, and the best means for dealing with them. This is contained in the "Materials Resource Efficiency Strategy" appended to this document. This section outlines a summary of the strategy and presents the commitments the Development Partners will make to ensure the impact on the environment due to demolition and construction materials use are minimised.

The Development Partners are committed to a strategic approach to managing materials and ensuring the reduction of materials sent to landfill sites. The headline issues that would be adopted for the development are:

- Construction will be undertaken with regard to the Code of Construction Practice (CoCP) that has been developed for the project and included in the Development Specification & Framework.
- All contractors will be required to develop and implement a Construction Environmental Management Plan for each site
- All contractors will be required to develop and implement a Site Waste Management Plan for each site
- All sites will be registered under the Considerate Constructors Scheme
- All demolition work will be carried out in accordance with the ICE Demolition Protocol
- For all construction work, an assessment of the recycled content (by value) will be undertaken using WRAP's Recycled-content toolkit.
- For all demolition work, at least 70% of materials arising will be reclaimed or recycled rather than sent to landfill
- For all construction work, a recycled content of at least 10% (by value) will be achieved.

4.2 Planning Policy and Guidance

The materials strategy has been developed with regard to the relevant national, regional and local planning policies and guidance notes. The key documents are as follows.

4.2.1 National Policy and Guidance

The main key national policy relating to energy is:

- Site Waste Management Plans (SWMP): Guidance for Construction Contractors and Clients (DTI, July 2004) (Issued as a voluntary code, but obligatory for all medium/large projects from late 2007).
- ICE Demolition Protocol (2005)

4.2.2 Regional Policy and Guidance

The Policy regarding materials use in construction in the London area is summarised in the following key documents:

- The Mayor's London Plan Consolidated with Alterations since 2004 (February 2008)
- SPG on Sustainable Design and Construction (GLA, May, 2006)

4.2.3 Local Policy and Guidance

The London Borough of Barnet has the following polices related to aggregates.

- Barnet UDP Policy Env5 (Aggregates)

The London Borough of Barnet has also published guidance in the following draft document:

- Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006)

4.3 Approaches to materials resource efficiency and reducing landfill

4.3.1 Goods and materials arising from demolition

Demolition contractors will be required to minimise the quantities of waste materials sent to landfill and to maximise the proportion of materials that are recycled.

This will be achieved through the use of:

- The ICE Demolition Protocol (2005) that formalises the auditing of materials streams during the demolition process and recycling, and
- The WRAP Recycled-content Toolkit ("10 quick wins") that formalises the procedure for assessing the proportion of recycled materials (by value) in new construction.

The benefit of this approach is that it formalises the process for auditing the materials arising from demolition and tracking their progress to help ensure they are recycled. A fuller explanation of the ICE Demolition Protocol and the WRAP Recycled-content Toolkit are given in Sections 3 and 8 of the Materials Resource Efficiency Strategy in Appendix D.

Adopting this approach responds directly to two of the "Preferred Standards" included in the GLA's SPG on Sustainable Design and Construction. (See SPG Paragraph 2.3.3 in Section 3.2.1 of this document).

In order to achieve these goals, demolition and construction contractors will be required to undertake the following:

- A pre-demolition audit will be undertaken of major buildings to be demolished.
- Demolition contractors will be required to adopt the ICE Demolition Protocol to track the materials recycled
- The preference will always be that buildings are deconstructed whenever possible to ensure the maximum reclamation of goods and materials.
- Deconstruction and demolition will be started in good time to ensure that the pre-demolition audit and a planned soft strip are undertaken prior to demolition.

- A materials handing facility will be set up in order that reclaimed goods and materials can be stored before being reused
- Demolition contractors will be required to ensure that at least 70% of materials or goods arising from deconstruction or demolition are reclaimed and reused or recycled, rather than sent to landfill.
- Contractors will be encouraged to use the Internet-based Salvo Materials Exchange scheme to seek uses markets for all demolition waste.

4.3.2 Construction waste

All contractors will be required to develop and implement a Construction Environmental Management Plan (CEMP) that will indicate how they meet the environmental commitments applying to their construction site(s). Details of the scope of the CEMP are given in the Construction Method Statement that accompanies the Environmental Statement (Volume BXC 2). The CEMP will incorporate a Waste Management Plan which will help ensure the reduction of waste generation and the quantities of waste that are consigned to landfill. In general terms this will reflect the Waste Hierarchy:

- Eliminate - prevent the creation of waste
- Reduce – reduce the creation of waste
- Reuse – use buildings or components for a second time
- Reclaim – refurbish goods or materials for reuse, without remanufacture
- Recycle – make “new” materials for making into building products
- Recover – gain benefit from waste by composting or thermal treatment

From mid-2007 it will be obligatory for contractors to develop and implement Site Waste Management Plans. This will help ensure that construction waste, and waste sent to landfill is minimised, for example by:

- Persuading suppliers to avoid or reduce packaging materials delivered to site
- Making suppliers responsible for removing waste materials generated as a result of using their products site
- Separating waste stream on site before collection, to facilitate recycling
- Measuring the quantities of different construction wastes generated, and setting targets to help achieve reductions
- Measuring the quantities of different construction wastes recycled and sent to landfill, and setting targets to help achieve reductions.

4.4 Approaches to materials selection and use of reclaimed materials

4.4.1 Reclaimed and recycled construction materials

Wherever possible, reclaimed goods and materials, and building projects with recycled content will be used. This will be facilitated by the following means:

- using recycled-content materials (e.g. steels from certain sources; recycled crushed aggregate; recycled polymers);
- where possible, any fill material will be crushed demolition waste;
- low-strength concrete, e.g. in the foundations will be made using at least 15% recycled crushed aggregate;

- wherever possible concrete will incorporate a proportion of Pulverized Fuel Ash (PVA) as a cement replacement;
- low-strength concrete, e.g. in the foundations will be made using recycled crushed aggregate; also much of the concrete will incorporate a proportion of Pulverized Fuel Ash (PVA) as a cement replacement;
- Some of the metals used (especially steel, aluminium, copper and zinc) will have a significant recycled content, although this may not be specified as a requirement: these metals are, in turn, fully recyclable;
- Where appropriate, Recycled–content Building Products will be used. In particular this is most likely to include various plastic products and, where appropriate, floor coverings;
- Contractors will be encouraged to use reclaimed goods and materials especially by means of a Materials Information Exchange (e.g. Salvo);
- Contractors will be required to use the WRAP Recycled-content toolkit to establish the value of recycled-content materials used in construction, and
- Contractors will be required to achieve a target of 10% recycled content (by value) in construction, verified using the WRAP toolkit.

4.4.2 Proscribed construction materials

A number of construction materials will be proscribed based on environmental considerations:

- No materials proscribed in the Montreal Protocol will be used in the construction or fit-out of buildings. In particular, refrigerants and insulation materials will have zero Ozone Depletion Potential (ODP), and
- No peat or natural weathered limestone will be used in buildings or landscaping.

4.4.3 New construction materials – good environmental practice

Where possible, construction materials will be selected with regard to the environmental impact associated with their use. This will favour the following approaches:

- sourcing materials from as close to the site as possible, to reduce the emissions of greenhouse gases from vehicles, and to reduce long distance transportation;
- 90% timber and timber products will be sourced from Forest Stewardship Council (FSC) sources and the balance from known temperate sources;
- Insulation materials will be selected that have zero potential to reduce the ozone layer ("zero ODP");
- Refrigerants will be selected that have zero potential to reduce the ozone layer ("zero ODP");
- Materials (e.g. paints and floor coverings) used inside the buildings will be selected to ensure they do not emit Volatile Organic Compounds (VOCs);
- Insulation materials will have as low a Global Warming Potential (GWP) as possible, subject to their availability and commercial constraints: the target will be to use materials with a GWP of less than 5;
- The use of new aggregates will be minimised. Wherever possible, especially in low-strength concretes, recycled crushed aggregates (RCA) will be used, and
- Wherever possible, all materials used for the construction and fitting out of the buildings will be selected from the A+, A, B or C-rated options given in "The Green Guide to Specification", published by the BRE (2009). The main exception will be when new methods of construction are proposed that are not covered by this guide.

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In line with GLA Policy 4A.4 (*Better use of aggregates*) and Barnet UDP Policy Env5 (*Aggregates*), every practical means will be used to reduce the quantities of virgin aggregates use in construction. This will mainly be achieved by maximising the use of recycled materials as aggregate replacements, mainly for low-strength concretes.

4.5 Commitments and targets – materials resource efficiency

The following table presents the measures that will be implemented at BXC in order to achieve the targets stated. The represent a summary of the Development Partners' response to the GLA's policies on Sustainable design and construction set out in the Materials Resource Efficiency Strategy in Appendix D.

Description	Reduce materials sent to landfill	Reduce use of environ-mentally damaging materials	Increase use of materials with low environ-mental impact	Commitment
Best practice on construction sites	✓	✓	✓	All contractors will be required to implement the Code of Construction practice for the BXC
Best practice on construction sites	✓	✓	✓	All contractors will be required to prepare and implement a Construction Environmental Management Plan (CEMP)
Best practice on construction sites	✓	✓	✗	All construction sites will be required to be registered under the Considerate Constructors Scheme
Reduce construction waste	✓	✗	✗	All contractors will be required to develop and implement Site Waste Management Plans (SWMP)
Soft strip buildings to facilitate reclamation of goods and components	✓	✗	✓	A pre-demolition audit will be undertaken of major buildings to be demolished. Demolition will be started in good time to undertake the pre-demolition audit and undertake a planned soft strip prior to demolition.
Recycle demolition waste	✓	✗	✓	Demolition contractors will be required to adopt the ICE Demolition Protocol to track the materials recycled
Use reclaimed goods / materials in new construction	✓	✗	✓	Contractors will be encouraged to use reclaimed goods and materials especially by means of a Materials Information Exchange (e.g. Salvo)
Use recycled-content building products	✗	✗	✓	Contractors will be required to use the WRAP Recycled-content toolkit to establish the value of recycled-content materials used in construction. Contractors will be required to achieve a target of 10% recycled content (by value) in construction, verified using the WRAP toolkit.
Use materials from sustainable sources	✗	✓	✓	90% of timber used in construction will be from sustainable sources (FSC)

Description	Reduce materials sent to landfill	Reduce use of environ-mentally damaging materials	Increase use of materials with low environ-mental impact	Commitment
Avoid materials that damage the ozone layer	✗	✓	✓	Materials listed in the Montreal Protocol will not be used (mainly covers fluorocarbons); Refrigerants will have an Ozone Depletion Potential (OPD) of zero whenever possible.
Use materials that cause minimum global warming	✗	✓	✓	Insulants used in building construction will have as a global Warming Potential of less than 5 (as defined in BREEAM-for-Offices 2006).
Use materials with low environmental impact	✗	✓	✓	Building materials will be selected from the A+, A, B or C-rated options given in The Green Guide to Specification published by the BRE (2009) unless this would mean the construction would not be able to deliver the necessary structural or environmental performance.
Avoid materials that lead to local air pollution	✗	✓	✗	Materials selected for use inside buildings (especially paints and floor covering) will not emit Volatile Organic Compounds (VOCs)
Use secondary aggregates / avoid the use of primary aggregates	✓	✓	✓	Wherever possible (for low-strength uses) concrete will be made using at least 15% (by weight) Recycled Crushed Aggregate (RCA).
Avoid scarce / non-renewable materials	✗	✓	✗	Contractors will be prohibited from using peat or natural weathered limestone for any purposes.
Use cement replacement materials	✓	✓	✗	Wherever possible Pulverised Fuel Ash (PVA) will be used as a cement replacement. If possible, the PVA will be taken from the CHP plant proposed for the site.

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5 Energy Strategy

5.1 Introduction

The BXC Development Partners are committed to delivering a scheme that is an exemplar of a commercially-viable, sustainable and carbon-efficient development and an "Energy Strategy and Assessment Report" (Volume BXC9) has been developed to illustrate and clarify these commitments. This has been developed in discussion with the GLA and the London Borough of Barnet.

A detailed study has been undertaken of the energy needs for the development, and the best means for meeting those needs. This is contained in the "Energy Strategy and Assessment Report" (BXC9) which deals with energy in terms of carbon dioxide emissions, since it is only by reducing the total world production of carbon dioxide that issues such as climate change will be successfully addressed. This summary schedules the commitments the BXC Development Partners will make to ensure carbon dioxide emissions are minimised through a strategic approach to energy use. Two options have been considered, the "Preferred" Option A and "Base" Option B.

The principal features of Option A are:

- Combined heat and power plant powered with refuse derived fuel from the waste handling facility in the Primary Development Package.
- Efficient power distribution, district/community heating and cooling networks; and
- "Future ready" distribution networks and building systems to allow for connection to future technologies e.g. hydrogen economy;

These features are estimated to achieve reductions between 50% and 60% of CO2 emissions, depending on the technology chosen, below 2006 Part L of the Building Regulations.

Acknowledging the potential difficulties of implementing such an Energy from Waste (EfW) facility, the Development Partners have developed a contingency plan - Option B. This option includes most features from Option A but excludes the energy from waste plant.

The key features of Option B are:

- Efficient power distribution district/community heating and cooling networks;
- Use of gas-fired CHP as an efficient method of energy generation; and
- Implementation of a combination of active and passive carbon dioxide mitigation measures as well as renewable energy sources.

The exact combination of the mitigation measures and renewable sources will be decided within the financial constraints of the development. In any case, residential buildings will achieve a reduction of 44% of CO_2 emissions, and non-residential buildings at least 20% below 2006 Part L Building Regulation levels by a combination of active and passive mitigation measures, and through use of energy from renewable sources.

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Independently of the option chosen, other major commitments from the BXC Development Partners include:

- Minimum target for BREEAM "Very Good" for office buildings and, for residential buildings, a minimum of 3 star under the Code for Sustainable Homes;

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- With the preferred energy from waste option in operation, the reductions in carbon dioxide emissions compared to Building Regulations Part L (2006) are likely to exceed 50%;
- Exemplar low carbon building incorporating renewable technologies; currently this building is expected to be a school, in which case it would be designed to achieve an "Excellent" rating under BREEAM-for-Schools; and
- Commercially aware energy strategy to ensure measures would be adopted to achieve commitments within this report.

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5.2 Planning Policy and Guidance

The Energy Strategy and Assessment Report has been developed with regard to the relevant national, regional and local planning policies and guidance notes. The key documents are as follows.

5.2.1 National Policy and Guidance

The main key national policy relating to energy is:

- Planning Policy Statement 22: Renewable energy. Includes a companion guide (ODPM, August 2004).

PPS22 sets out the Government's policies for renewable energy, which planning authorities should have regard to when preparing local development documents and when taking planning decisions.

5.2.2 Regional Policy and Guidance

The Policy regarding energy use in the London area is summarised in the following key documents:

- The Mayor's London Plan consolidated with alterations since 2004 (GLA, February 2008);
- Green Light to Clean Power: they Mayor's Energy Strategy (GLA, February 2004);
- Integrating renewable energy into new developments: Toolkit for Planners, Developers and Consultants (GLA, September 2004), and
- SPG on Sustainable Design and Construction (GLA, May, 2006).

The reduction of carbon dioxide emissions by means of reducing the use of fossil fuels forms a central strand of The London Plan (February 2008). Six key policies address this objective. They are reproduced in Section 12 of this document.

- GLA Policy 4A.4 Energy assessment;
- GLA Policy 4A.5 Provision of heating and cooling networks;
- GLA Policy 4A.6 Decentralised Energy: Heating, Cooling and Power;
- GLA Policy 4A.7 Renewable energy;
- GLA Policy 4A.8 Hydrogen Economy, and
- GLA Policy 4A.9 Adaptation to Climate Change.

5.2.3 Local Policy and Guidance

The London Borough of Barnet UDP has the following polices related to energy supply and conservation. They are reproduced in Section 14.

- Barnet Policy Env1 Energy supply, and
- Barnet Policy Env2 Energy conservation

The London Borough of Barnet has also published guidance in the following draft document:

- Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006)

5.3 Approaches to energy efficiency and reducing carbon dioxide emissions

The energy use has been addressed in terms of the GLA's policy to "Be Lean, Be Clean, Be Green", i.e. use less energy, use energy efficiently, and use renewable energy. This approach is demonstrated by reducing energy demands according to the following hierarchy:

- Reduce building energy use by passive means, e.g. building fabric, form, etc;
- Reduce building energy use by active means, e.g. heat recovery, control systems, etc;
- Distribute and generate energy efficiently e.g. high voltage power networks, CHP, CCHP, district/ community heating, cooling, etc, and
- Utilise renewable energy sources, e.g. energy from waste, wind, sun, etc.

As their preferred Option A, the BXC Development Partners are committed to use all reasonable endeavours to develop an Energy from Waste plant to achieve the carbon dioxide reductions whilst also addressing the waste issues. The final implementation of this option is subject to the successful conclusion to negotiations with key stakeholders, in particular the North London Waste Authority.

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The BXC Development Partners recognise the unique opportunity to treat residual non-recyclable waste at the relocated waste handling facility, to create a renewable fuel for use in the CHP plant. This CHP generation system will provide heat through a district heating network, the potential for cooling using absorption chillers, and power to the site, thereby creating a virtuous circle of energy and waste that achieves significant reduction in carbon dioxide emissions via a locally generating renewable source. The close proximity of the waste handling facility to the rest of the development would enable the maximum possible benefit to be gained from this approach as distribution losses would be minimised. This approach is likely to achieve reductions in emissions of carbon dioxide of between 50% and 60%. The exact level will depend on the specific technology adopted.

Energy in the form of heat, cooling and power would be distributed by local networks so that distribution losses are minimised. District / community heating, and subject to demand and localisation cooling, distribution services will be installed throughout residential, hotel and potentially the commercial elements of the development to enable the provision of affordable thermal energy and thus significantly reducing the risk of fuel poverty to at-risk residents. The provision of these thermal networks would enable emerging and as yet undeveloped technologies to be adopted when commercially and practically viable. It may therefore be feasible in the future to incorporate fuel cells in conjunction with these systems when the hydrogen economy is developed and distribution is viable on a commercial scale.

It is intended to provide heat, via a district heating scheme, and power for the development from a large CHP plant that will be constructed during the PDP. Any building constructed and ready for occupation before the CHP and its associated infrastructure for the purposes of connecting it to the buildings within the scheme are operational will be provided with heat, via appropriate infrastructure, from a local centralised boiler and with electricity from the grid. These buildings would be designed in such a way that they would be able to be

connected to the CHP and the district heating scheme, via the appropriate infrastructure, when this becomes operational.

Until the CHP is constructed the buildings will be provided with heat and power from a number of smaller installations each with its own local distribution network and infrastructure.

Acknowledging the project risks associated with the implementation an energy from waste facility, the BXC Development Partners have developed a contingency strategy – Option B – including most elements of Option A apart from the EfW plant. In this option, the CHP providing power and feeding the district heating scheme would be fuelled by natural gas and the carbon reductions would be achieved by means of active and passive measures and the use of some energy generated on site from renewable sources.

In both Options A and B residential buildings would achieve a reduction in carbon dioxide emissions of at least 44% and non-residential buildings at least 20% compared to the requirements Building Regulations Part L (2006). The technologies to achieve these reductions are not specified at this early stage of the development. However, as details of each building come forward for consideration by the LPA as reserved matter applications, the applicants will be required to demonstrate how the reduction in carbon emissions will be achieved.

Carbon dioxide mitigation - the reduction in carbon dioxide emissions by active and passive measures - will be adopted throughout the development because this offers the most efficient method of carbon dioxide reduction. To gain the maximum possible reduction it is important that the £/tonne of carbon dioxide saved be considered, so the maximum benefit is attained within the project's financial constraints. Indeed, to adopt renewable technologies to the detriment of carbon dioxide mitigation measures would miss an opportunity to minimise the impact of this development.

In order to demonstrate the project's commitment to carbon dioxide reduction, the initial phase of the project would commit to, as suggested within "The London Plan", an exemplar building which would be a demonstration project to show, without commercial constraints, a number of the various emerging and renewable technologies.

During the Primary Development Package carbon dioxide emissions will be at least 20% below current regulatory requirements, which is equivalent to an estimated saving of 1,200 tonnes of carbon dioxide by a combination of carbon dioxide mitigation measures and use of renewable technologies.

The BXC Development Partners are also committed to introducing several exemplar features that will influence the entire site. These include the possible use of a vacuum waste collection system to transfer waste underground from the development to the relocated waste handling facility plant, and tri-generation using CHP plant, potentially fuelled by refuse-derived fuel. If the BXC Development Partners are allowed to develop this combined system, it would be unique in the United Kingdom and serve as a National exemplar.

In conclusion, the Brent Cross Cricklewood development offers an exemplar of how to create a synergy with energy and waste strategies whilst adopting design to minimise the carbon footprint of the entire development by practical, commercially viable and innovative solutions. These solutions would generally be considered

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standard in many parts of Europe hence offer benefit as they are a tried and tested solution whilst being innovative for the UK and London.

5.4 Commitments and targets – Energy and carbon dioxide emissions

The following table details the measures that the development proposals will utilise in order to achieve the targets stated.

Description	Use Less Energy	Use Renewable Energy	Supply Energy Efficiently	Commitment
Review development of energy from waste technology options on a combined heat and power basis.	✓	✓	✓	Develop ability to use the waste handling facility as an Energy from Waste CHP plant in phase one using refuse derived fuel to supply district heating, cooling and power to the development. Subject to finalisation of this scheme this will offer the ability to decrease CO2 emissions by use of renewable technologies. It is predicted that it will reduce development's CO2 emissions in excess of 50% of a purely 2006 Part L Building Regulations compliant scheme.
Site wide CHP / CCHP	×	×	✓	Built a CHP plant potentially using refuse derived fuel during Primary Development Package of the development.
Efficient distribution of power	×	×	✓	Provide high voltage ring main supplies.
Site wide heating scheme	×	×	✓	Provide networks for heating and cooling district heating network for residential and hotel buildings at the development.
Trigeneration/ absorption cooling	×	✓	✓	Subject to development of energy from waste study and benefits in both carbon dioxide emissions and financial constraints, develop absorption cooling on a per building or per zone basis.
Individual building CHP	×	×	✓	Consideration for each building or combination of them, including micro CHP for individual offices or houses, should the scheme wide facility not be operational.

Description	Use Less Energy	Use Renewable Energy	Supply Energy Efficiently	Commitment
Reduce site wide carbon dioxide emissions	✓	✓	✓	The use of various combinations of measures including the use of renewable energy, within commercial constraints, to achieve reductions in carbon emissions below 2006 Part L Regulations of 44% for residential and 20% for non-residential buildings.
Reduce fuel poverty	✓	×	✓	Efficient community gas heating systems for residential blocks.
Demonstration project – exemplar building	✓	✓	✓	Major public building- possibly a school - to be low carbon / renewable energy demonstration project.
Private wire network	×	✓	✓	Provide networks for utilization by private wire schemes to enable distribution of power from CHP/ renewable electricity generation.
Building performance standards	✓	×	×	Minimum target for BREEAM "Very Good" for office buildings and, for residential buildings, a minimum of 3 star under the Code for Sustainable Homes.
Day lighting	✓	✓	×	Develop buildings detailed designs to provide maximum commercially viable daylight / solar gain balance within the scheme parameters.
Artificial lighting	✓	×	×	Provide efficient designs and fittings with control systems suitable for application.
Building fabrics and glazing	✓	×	✓	Exceed 2006 Part L Building Regulation requirements.
Heat recovery	✓	×	✓	Provide energy/ cost viable solutions in order to provide carbon mitigation.
Amenity / parking ventilation	✓	×	×	Maximise use of natural and demand driven systems whilst maintaining environment and commercial requirements.
PV / solar water / wind	×	✓	×	Consideration will be given on a building by building or phased basis as necessary.

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Description	Use Less Energy	Use Renewable Energy	Supply Energy Efficiently	Commitment
Planned preventive maintenance	✓	×	✓	Monitor, publish and improve development's operational energy use.
Wind generation	×	✓	×	Consider at the detailed design stage as part of the assessment of achieving the renewable energy target.
Waste collection system	-	-	-	Create an underground waste transfer network, subject to agreement on the use of energy from waste technology at the waste handling facility;

6 Water Resource Efficiency Strategy

6.1 Introduction

The BXC Development Partners recognise the importance of reducing the demand for potable water and are committed to delivering a scheme that will achieve this aim.

A detailed study has been undertaken of the potable and non-potable water needs for the development, and the best means for meeting those needs. This is contained in the "Water Resource Efficiency Strategy" reproduced in Appendix E. This summary schedules the commitments the developers will make to ensure water use is minimised.

The Development Partners are committed to a strategic approach to water use and the reduction of demand for potable water. The headline issues that would be adopted by the development are:

- An education programme for residents and commercial users, through the office of the estate management company, to raise awareness of water reduction measures;
- Residential developments to achieve water usage of 105 litres/person/day (38.3 cubic metres / person / year; equivalent to the level needed to gain a 3-star rating using Code for Sustainable Homes), with an aspiration to meeting the target of 80 litres/person/day (29.2 cubic metres/person/year, equivalent to 5-star rating using Code for Sustainable Homes);
- An exemplar building incorporating all water reduction and recycling measures;
- rainwater harvesting will be designed to capture 10% of rain falling on the site for irrigation and cleansing use;
- grey' water will be recycled from commercial buildings, if that proves necessary to meet demand, and
- Recycling water used in the waste treatment plant.

6.2 Planning Policy and Guidance

The growing demand for water, together with the losses from the water supply infrastructure and the anticipated reduction in rainfall that is expected to accompany climate changes that are currently predicted, all mean that the use of water will need to be much more carefully managed than hitherto.

6.2.1 Regional Policy and Guidance

The need to address water supply and use is reflected in the Mayor's London Plan Consolidated with Alterations since 2004 (February 2008), in Policy 4A.16 which deals with water supplies and resources.

> Policy 4A.16 Water supplies and resources
>
> The Mayor will work in partnership with appropriate agencies within London and adjoining local planning authorities to protect and conserve water supplies and water resources in order to secure London's needs in a sustainable manner by supporting the Water Strategy and by:
>
> - minimising the use of treated water
> - reaching cost-effective minimum leakage levels

- maximising rainwater harvesting opportunities
- introducing targets for water recycling in major developments
- promoting the use of dual potable and grey water recycling systems
- in conjunction with demand side measures, promoting the provision of additional sustainable water resources in a timely and efficient manner, to reduce the water supply deficit and achieve a security of supply in London
- minimising the amount of energy consumed in water supply processes
- ensuring that adequate sustainable water resources are available for major new developments and for conservation and enhancement of the natural environment
- maintaining and upgrading the infrastructure.

In determining planning applications, the Mayor will, and boroughs should, have proper regard to the impact of those proposals on water demand and existing capacity. The Mayor will, and boroughs should, apply a maximum water use target of 105 litres per person per day for residential development, adjusting in future years through reviews of the plan, which will take into account the then prevailing standards in the Code for Sustainable Homes.

Between the appearance of the London Plan in 2004 and The London Plan: Consolidated with Alterations since 2004 (GLA, February 2008), there was published the Mayor's draft water strategy which has also been considered while developing the Water Resource Efficiency Strategy:

- Water Matters. The Mayor's Draft Water Strategy (GLA, March 2007)

6.2.2 Local Policy and Guidance

The London Borough of Barnet UDP has the following polices related to water quality and drainage. They are reproduced in Section 14.

- Barnet Policy Env8 (Water conservation)
- Barnet Policy Env11 (SUDS)

The London Borough of Barnet has also published guidance in the following draft document:

- Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006)

6.3 Approaches to water resource efficiency and reducing water use

The Development Partners for Brent Cross Cricklewood are committed to reducing the impact of the development on the environment. With respect to the use of water, they have taken guidance from both the GLA's guidance in the Mayor's London Plan, and the SPG on Sustainable Design and Construction, as well as from the London Borough of Barnet in its Draft Supplementary Planning Document (SPD) on Sustainable Design and Construction (November 2006).

A Water Resource Efficiency Strategy has been produced to review the opportunities for reducing the demand for potable / treated water and replacing the use of potable water. It addresses first the opportunity for demand

reduction and then the potential for harvesting rainwater and recycling grey water as an alternative source of water for non-potable uses to supplement the local metered supply.

A site wide strategy will be implemented to reduce water usage based first on:

- installation of water-saving devices, then
- the efficient use of the water supplied to the site using water saving devices, and finally
- the reuse / recycling of the water prior to discharging into the sewage system.

The baseline position has been assumed to be that all water for the whole development would be supplied by Thames Water.

In residential buildings the water usage will be reduced to less than 105 litres / person / day (approx. 38.3 cubic metres / person / year) based on estimates made using the Code for Sustainable Homes water calculator, by introducing the following features:

- Dual flush WC's (6/4 litre flush);
- Metering of water;
- Flow restrictors (6 litres/minute) on wash hand basin taps;
- Flow regulated (9 litres/minute) showers;
- Small baths (<150 litres);
- Installation of dishwashers using <12 litres per cycle, and
- Installation of washing machines using <40 litres per cycle.

It is estimated that the adoption of these various measures will reduce potable water consumption from around 2.9 Billion litres of water per year to around 2.3 Billion litres of water per year. This represents a reduction of around 20%, saving enough water to fill about 300 Olympic swimming pools per year.

In anticipation of a countrywide increase in the cost of water treatment and supply by water companies, the use of all the above water-saving devices is examined in this Water Resource Efficiency Strategy.

Harvesting and use of rainwater also serves to reduce the amount of surface water run off in an area where the surface water discharges to the local watercourse or surface water sewer. This strategy would, therefore, support the flood protection measures recommended by the Environment Agency. The reuse of grey water helps reduce the increased load on local sewage treatment plant and will help to reduce waste water disposal costs for the development during construction.

While it may be possible to use borehole water extraction, it is considered unlikely that this will be feasible for the following reasons:

- The development site is classified as a Brown field site and already "over licensed";
- The ground water is known to be heavily contaminated, and
- The Environment Agency is committed to terminate and renegotiate all existing extraction licences in 2013. Since this may result in a licence being revoked, or in much higher extraction costs, reliance on water from boreholes should be considered as high risk.

Detailed studies during the Primary Development Package (PDP) of the development will be carried out to ascertain the opportunities for using grey water collected from buildings in the PDP during the later phases of construction, for example to supply water needs of construction sites, such as wheel washing, road-way

cleaning and site toilet flushing. The high degree of treatment needed will make it unlikely that this water would be used to supply potable water (which includes the water used in making concrete).

6.4 Commitments and targets – water resource efficiency

The following table details the measures that the development proposals will utilise in order to achieve the targets stated.

Description	Efficient water distribution	Reduce user-demand for potable water	Water reuse	Commitment
Efficient supply network	✓	×	×	During construction all water mains will be repaired to deal with any leaks found
Efficient supply network	✓	×	×	New networks to be managed
Water use meters	✓	✓	×	To meter the water use, and educate the population on how to use this to reduce demand.
Leak detection	✓	✓	×	To install an internal leak detection systems to the business and commercial buildings
Auto shut off to toilet areas	✓	✓	×	PIR auto shut off devices to be installed in commercial / public buildings
Water use target	×	✓	×	Water use in residential buildings will not exceed 105 litres/person/day, as calculated using the Code for Sustainable Homes Water Calculator.
Dual flush wc's	×	✓	×	Install dual flush 6/4 litres per flush in all buildings
Flow restrictions on wash hand basins taps	×	✓	×	6 litres/min flow regulators to be installed
Low-flow taps	×	✓	×	Install low-flow / spray taps wherever possible
Flow regulated showers	×	✓	×	9 litres/min flow regulators to be installed
Small baths	×	✓	×	Install baths with a capacity of < 150 litres

Low water appliances	✗	✓	✗	Install A-rated white goods
Use of dishwasher	✗	✓	✗	Install machines that use < 12 litres per cycle
Use of washing machines	✗	✓	✗	Install machines that use < 40 litres per cycle
Waterless urinals	✗	✓	✗	Investigate opportunities building by building and propose when sufficient maintenance will be offered
Rainwater harvesting	✗	✓	✓	Rainwater harvesting will be designed to capture 10% of rain falling on the site for irrigation and cleansing use.
Rainwater harvesting (domestic)	✗	✓	✓	Residences with gardens or suitable balconies will be provided with water butts to harvest rainwater for irrigation.
Grey water use	✗	✗	✓	'Grey' water will be recycled from commercial buildings, if that proves necessary to meet demand
Grey water use	✗	✗	✓	Undertake studies to identify other opportunities for using grey water, such as wheel and road washing on construction sites, street cleaning, and cleaning of building façades / windows.

7 Operational Waste Strategy

7.1 Introduction

The BXC Development Partners recognise the importance of reducing the quantities of waste arising from the operation of the development and minimising the waste sent to landfill. They are committed to delivering a scheme that will achieve this aim partly and subject to feasibility by the use of an underground vacuum waste collection system that will facilitate the recycling of materials and also reduce the use of waste collection vehicles and, hence, emissions of exhaust gases to the atmosphere. The Development Partners are also committed to providing an energy-from-waste scheme that will create a renewable fuel to power a CHP plant.

7.2 Policy and Legislation

The following legislation and policy relating to operational waste are considered to have relevance to the Development:

International Policies	The Waste Framework Directive
	The Landfill Directive
	The Hazardous Waste Directive
	Packaging and Packaging Waste Directive
	End of Life Vehicles (ELV) Directive
	Waste Electrical and Electronic Equipment (WEEE) Directive
National Policies	Environmental Protection Act 1990
	Waste Strategy for England 2007
	Waste and Emissions Trading Act 2003
	Household Waste Recycling Act 2003
	Hazardous Waste Regulations 2005
	The Site Waste Management Plans Regulations 2008
	National Planning Framework
	UK Packaging and Packaging Waste Legislation
Regional Policies	The Mayor's Municipal Waste Strategy
	The London Plan: Consolidated with Alterations since 2004 (GLA, February 2008)
	London Business Waste Strategy
	SPG on Sustainable Design & Construction
Local Policies	The North London Joint Waste Strategy 2004 - 2020
	The emerging North London Waste Plan
	London Borough Barnet Waste Prevention Strategy 2005 – 2020
	London Borough Barnet Waste Local Plan
	London Borough Barnet Unitary Development Plan

Further information on waste legislation is presented in the Environmental Statement. Those Policy documents and legislation that impose targets on the way waste is managed are summarised in the following table:

Legislation / Policy Documents	Targets
Landfill Directive The Landfill Directive is seen as providing the principal legal framework influencing Municipal Solid Waste management and strategy development in the UK. The most significant part of the Directive is Article 5 which proposes a strict timetable for reductions in landfilling biodegradable waste. These are onerous requirements and have been the principal influence on the formulation of 'Waste Strategy 2007'.	• By 2010 to reduce biodegradable municipal waste (BMW) landfilled to 75% of that produced in 1995; • By 2013 to reduce biodegradable municipal waste landfilled to 50% of that produced in 1995; • By 2020 to reduce biodegradable municipal waste landfilled to 35% of that produced in 1995;
Waste Strategy for England, 2007 The Waste Strategy for England 2007 forms the principal policy document relating to waste within England. It addresses all waste streams and sets specific targets for industrial and commercial waste, and municipal waste.	Targets established for municipal waste include to recover value from: • 53% of municipal waste by 2010; • 67% of municipal waste by 2015; • 75% of municipal waste by 2020. Targets for recycling and composting of household waste include to recycle or compost: • at least 40% household waste by 2010; • at least 45% of household waste by 2015; • at least 50% of household waste by 2020.

London Plan – Consolidated with Alterations since 2004 (published February 2008)
The London Plan was first published in February 2004 and provided a strategic plan to guide and inform the development of London over the coming decades. A number of alterations to the London Plan have been published since 2004, and in February 2008 an updated version of the London Plan was released, consolidated with alterations introduced since 2004.
	The latest version of the London Plan includes the following key policy initiatives:
	• exceed recycling or composting levels in municipal waste of:
	  • 35 per cent by 2010
	  • 45 per cent by 2015
	• achieve recycling or composting levels in commercial and industrial waste of 70% by 2020, and
	• achieve recycling and re-use levels in construction, excavation and demolition waste of 95 per cent by 2020.

North London Joint Waste Strategy The Authority is currently preparing a new Joint Waste Strategy that will cover the period until 2020. This strategy will be used to facilitate the procurement of new Waste Management Services to increase recycling and recovery and divert more waste from Landfill. It will be used to plan and inform the new NLWA integrated waste management contract that is due to be let when the current contract ends in 2014.	The strategy includes targets for household waste of a recycling and composting rate of 35% in 2010 and 40% in 2015.

An outline of how the Development Partners will meet these objectives and targets at Brent Cross Cricklewood are provided below.

7.3 Sustainable Waste Initiatives

Two particular initiatives regarding waste management are mentioned here, because of the considerable environmental benefit they are expected to deliver.

7.3.1 Waste to Energy

The application involves the re-provision of a waste handling facility. It is anticipated that the facility will be operated by North London Waste Authority and, as a result, the Development Partners are engaging with them over the potential design and configuration of the facility. Recognising the potential of the facility, the Development Partners are intending to incorporate technology to treat residual waste to create a fuel for the CHP facility, thus providing heat and power to the site.

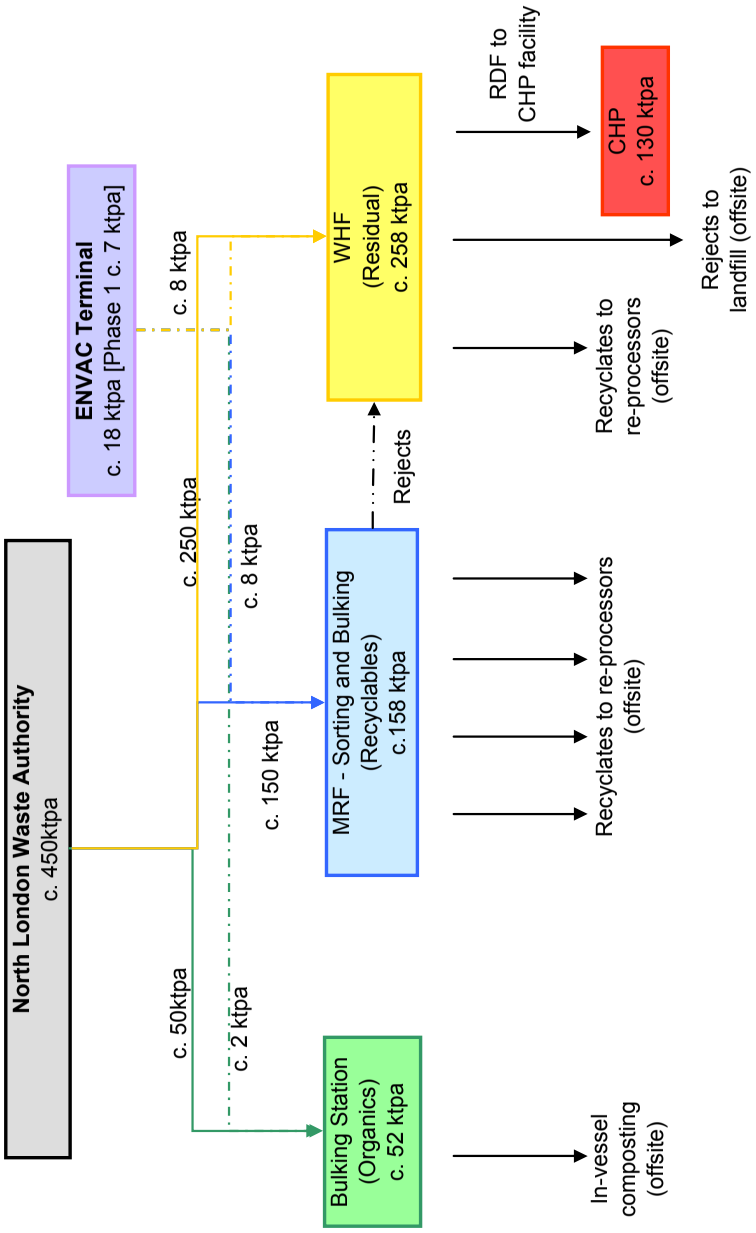
The main environmental benefits of this proposal are as follows:

- reducing vehicle journeys that would be needed to transport municipal waste out of Barnet;
- reducing the exhaust emissions associated with these journeys;
- generating energy for local consumption, thus avoiding transmission losses;
- benefiting from the efficiencies of co-generation inherent in CHP;
- helping reduce the waste sent to landfill, and
- helping achieve recovery targets.

The proposed waste management scheme would comprise a fuel preparation facility and a separate energy from waste facility. Other related elements of the waste management scheme will include a materials recycling facility to deal with source segregated dry recyclable materials, and a bulking facility for source segregated organic materials (for composting or anaerobic digestion off-site).

Fuel preparation, in this particular context, is used as a generic term to describe the receipt and treatment of residual municipal waste to produce a material which is suitable for feeding into an advanced thermal treatment energy from waste (EfW) process. A diagram illustrating the overall waste flows for the proposed waste management scheme is provided in Figure 7.1, below.

Figure 7.1 Brent Cross Cricklewood: Estimated Waste Flows



Currently it is proposed that the fuel preparation and other waste handling elements of the scheme (materials recycling facility and organic materials bulking facility) will be located on an area of land between the Edgware Road and the mainline railway. The combined heat and power (EfW) facility is to be located in the north-west corner of the Development itself.

The fuel preparation facility is sized for the receipt and treatment of around 258,000 tonnes/annum of residual municipal solid waste (MSW) delivered in refuse collection vehicles (RCVs); this will in effect replace the current transfer of waste off-site for landfill via the Hendon Waste Transfer Station. A proportion of the waste stream to be treated will also arise from the proposed Development itself, which, subject to its feasibility, will be delivered to the fuel preparation facility via an underground vacuum collection system as described below.

It is anticipated that approximately 50% of the residual waste will be processed into an RDF/SRF fuel with a higher net calorific value following removal of certain plastic and metal recyclable materials and a degree of moisture. The RDF/SRF may be processed into a refined “floc” or “pellet” form depending on the actual fuel preparation technology selected.

When referring to EfW (energy from waste) in this particular case this includes thermal processes which are often described as advanced thermal technologies (ATT) or advanced conversion technologies (ACT); this includes gasification/pyrolysis, but does not include mass burn incineration.

The EfW facility is likely to include the following key elements:

- A separate and dedicated building accepting and thermally converting approximately 130,000 tonnes/annum of floc or RDF pellets to produce a synthesised gas;
- Steam generation boilers which would be fired by the synthesised gas;
- A steam turbine generator capable of generating and exporting approximately 14 to 16MW of electricity depending on the characterisation of the fuel; and
- A heat exchanger and pumping system to circulate the heating water through a district heating mains pipework system.

The proposed Waste Handling Facility (excluding the EfW facility) will form an integral part of North London Waste Authority’s (NLWA) future waste management plans. The precise details of the fuel preparation element of the facility have yet to be finalized (and will be finally selected through the contract procurement process currently being planned by the NLWA), although it is anticipated that it will include one of the following generic technologies:

- Mechanical biological treatment (MBT); or
- Mechanical heat treatment (MHT).

Whichever techno logy is finally chosen, it is clear that there will exist significant opportunities to integrate waste generation, collection, recycling, recovery and disposal functions into a fully integrated waste management strategy.

Provision of the EfW element of the overall waste management scheme would provide considerable opportunity to integrate energy generation from the facility with the utility requirements of the Development. Such integration could be in the form of electrical energy and district heating and/or district cooling.

Where energy generation qualifies as renewable either by virtue of the technology employed, the conversion of waste into a biomass fuel or the adoption of 'good quality' combined heat and power (CHP) then the beneficial utilisation of residual waste from the Development offers the potential to provide a significant proportion of the Development's energy requirements as 'Renewable Energy'.

Whichever technology is finally adopted, and assuming that the method of residual treatment will comprise an element of energy generation, and that all suitable waste will be managed through the facility, it is anticipated that overall recovery rates for waste generated from the Development will exceed 85%.

The overall performance of the proposed waste management scheme (Waste Handling Facility and EfW facility) will also result in an overall diversion figure in excess of 85%, therefore minimizing the amount of waste that may go to landfill to less than 15% of the total accepted at the facilities.

7.3.2 Vacuum Collection of Waste

The Development Partners intend, subject to feasibility, to utilise a vacuum waste collection system. However, given the innovative nature of the technology and the limited number of manufacturers and operators in the current market, its delivery will be dependent upon the availability of providers. If adopted, the system will simplify in-building waste management largely eliminating the need for waste collection areas and caretaker input, except for bulky type materials.

The main environmental benefits of this proposal are as follows:

- reducing vehicle journeys that would be needed to collect and transport municipal waste from buildings to the waste handling facility;
- reducing the exhaust emissions associated with these journeys;
- reducing the cluttering of pavements with dustbins and plastic bags, and
- helping achieve waste management targets.

Used widely in Sweden and other parts of Europe and the Middle East, underground vacuum systems offer the ability to collect different waste fractions with minimal collection vehicle requirements. The system consists of waste collection points connected together by an underground pipe network. The pipe network ends in a terminal station, which is often located outside of the residential area, easily accessible by container lorries.

The users of the underground waste collection system deposit their waste (loose or bagged) in a waste inlet located at the collection point with a single inlet for each separate waste fraction collected. The collection points are located at a convenient distance (normally within 50 m distance) from each residential unit. The waste is temporarily stored under the inlet and on top of a storage valve.

At regular intervals, or when the storage level has exceeded a certain level, the inlets are emptied and the waste is transported in the pipe network, by means of air as the medium of transportation, to the waste terminal. At the waste terminal, the individual waste fractions are automatically compacted and periodically transferred off-site for subsequent processing and disposal

The main disadvantage of such systems is the initial capital cost, although there are many benefits to the system including the ability to co-collect commercial and residential waste, avoidance of waste storage within buildings,

reduced staff input and avoidance of waste collection vehicles. Table 7.1, below, provides a comparative overview of the advantages and disadvantages of the two approaches to waste collection.

Table 7.1. Waste Collection and Handling Options

Residual Waste Collection	
Communal bins and refuse collection vehicles (with our without chutes)	• Standard practice • Potential anti-social/environmental issues • Bin store required in each multi- occupancy building with vehicle access • Separate collection required for household and commercial waste
Vacuum waste collection system (e.g. ENVAC)	• Avoids many of the issues above • Can facilitate household and commercial collections • Can link to on-site or off-site (NLWA Waste Handling Facility) facility • Reduces need for collection vehicles • Will not handle all wastes (e.g. bulky, cardboard, glass) [1] 1. Note that there will be a need to allow for the storage of bulky waste in multi-unit residences)

The actual realisation of a vacuum waste collection system will depend on a number of factors, especially the successful conclusion of discussions with the various stakeholders, including North London Waste, and the provision of a Waste Handling Facility on the BXC site.

7.4 Strategy for management of operational waste

7.4.1 Responsibility for Waste Management

The primary responsibility for waste management lies with the producer, particularly with regard to implementing measures to reduce and minimise the generation of waste. Beyond this, the overall waste stream arising from the development can be divided into two principal categories, as follows:

- The collection, handling, treatment and disposal of household waste is currently the responsibility of the Local Authority (LB Barnet) as Waste Collection Authority and North London Waste (as the sub-regional Waste Disposal Authority). Whilst it is possible that these responsibilities may change over the life of the development, it should be assumed that the current arrangements will continue for the foreseeable future. The responsibility of the householder to segregate waste at source into recyclable and compostable fractions must also be highlighted since the success of any household waste recycling scheme is entirely dependent on the effective participation of all householders.
- Arrangements for the collection, handling, treatment and disposal of commercial waste are the responsibility of the waste producers (or agents acting on their behalf) to put in place. In most, if not all situations, the waste producer will contract out all activities relating to the collection, handling, treatment and disposal of wastes, often utilising the services of a private waste management company (although

the option also exists for a commercial waste producer to request the Waste Collection Authority to collect the waste and to be charged for the service accordingly). The waste producer will, however, have a primary responsibility to manage waste at the point of arising in order to maximise opportunities for reuse, recycling and recovery. For larger waste producers (and there are likely to be a number occupying certain parts of the Application proposal area) there will be a legal responsibility to meet the requirements of the Producer Responsibility Obligations (Packaging Waste) Regulations 1997.

To maximise effectiveness proposed mitigation approaches are based on a combination of design and management, with a key consideration being the 'producer responsibility'.

7.4.2 Management of Household Waste

The principal focus for management of household waste will be to introduce segregation and recycling at source in order to facilitate the separation of recyclable and compostable elements of the waste stream. The provision of suitable facilities and space for the segregation and storage of different waste streams identified will therefore be required. This will limit the quantity of wastes arising for disposal and assist in meeting the UK government, GLA, NLWA and LB Barnet policy targets. LB Barnet already has an extensive kerbside collection scheme in place which focuses on glass, paper and cans. The kerbside collection scheme is currently operated on behalf of the Authority by Ealing Community Transport (ECT) Recycling and includes recycling services for flats and high-rise residences.

Management of household waste arising from the development is likely to include the following key elements (although of key importance is to recommend that the waste segregation and storage facilities are convenient and simple to use):

- Provide detailed information to new residents on the importance of waste prevention, reuse, recycling and recovery. Evidence elsewhere in the UK clearly indicates that well planned and implemented public information and awareness raising programmes are effective in increasing householder participation in recycling schemes. LB Barnet currently runs an awareness campaign and welcomes assistance in spreading the message;
- Providing home composters to householders at low cost. LB Barnet already operates such a scheme, providing composters to householders at subsidised rates;
- Providing a kerbside collection scheme to all householders, to include the separate collection of dry recyclable wastes, including glass, paper, metals and textiles (the Council may introduce collections of plastics in the future) and compostable wastes, including garden and kitchen derived organic materials; and
- Collection of residual wastes (those wastes which remain after the separation of materials for recycling and composting).

Provision of the above services will principally be the responsibility of LB Barnet, and therefore it will be necessary to agree the final details of all elements of the service with the Council, and how they will be introduced within the community as the development progresses.

With careful planning and implementation there is no reason why high diversion rates should not be achieved for the residential element of the overall development.

The disposal of residual waste is currently the responsibility of the sub-regional Waste Disposal Authority, North London Waste Authority. Residual waste from the development will be collected by LB Barnet and delivered to

the proposed Waste Handling Facility (which will replace the existing Hendon Waste Transfer Station) for subsequent treatment and disposal either on-site or off-site.

At this stage it is not possible to be specific in terms of how the residual waste will be managed, but it is inevitable that the introduction of residual handling and treatment will increase the potential for recycling / recovery and therefore further reducing the quantity of waste delivered to landfill for final disposal.

For the collection of both recyclable and residual household waste, careful consideration will need to be given to the type of dwellings to be developed as part of the planned redevelopment. The predominance of multi-occupancy or high rise dwellings will impact on the nature of collection systems available. For example, it is likely that communal mini-recycling areas and residual waste storage areas may prove more suitable than wheeled bins or boxes for each dwelling.

7.4.3 Management of Commercial Waste

The approach to the management of Commercial Wastes will be similar to that for Household Waste in the sense that priority will be given to segregation at source in order to facilitate diversion for reuse, recycling and composting. The potential for achieving high diversion rates for Commercial Wastes exists, and with sound planning and implementation there is no reason why this potential should not be realised.

In summary, the general approach to handling wastes arising from the three principal development categories which will produce Commercial Wastes will be as follows:

- Business Use (Class B1): Many offices have mobile segregation facilities within each defined office area, depending on the environmental policy of the company renting the office space. It is rare for an office to be designed with built-in waste segregation facilities as there is an on-going operational, logistical cost which will be met by the owner when the office is vacant, or the company renting the premises when occupied. Accessible waste collection facilities are however, required regardless of whether the material is segregated or un-segregated. Compaction and baling may be used to minimise storage requirements;
- Food and Drink (Class A3): Most waste collection from this type of development is through private waste management operators; in the past this has been through trade waste contracts for residual wastes. Given the more stringent obligations for companies within this sector to segregate their waste this type of arrangement is likely to become more complicated. There will always be a need for residual waste collection, as before, however there will also be an increased need for different collection facilities to be provided for glass, paper and card, metals, plastics and increasingly food waste. The size of these collection containers will depend on the size of outlet, frequency of collection and materials being collected;
- Retail Outlets (Class A1 / A2): Waste collection for this type of development has traditionally been carried out under trade waste contracts. As with the food and drink sector there is often an obligation under the packaging regulations for companies to segregate their waste into different material streams and many of the larger obligated businesses will have secured national waste collection contracts. It is therefore difficult at this stage to detail exact waste facility requirements because the precise nature of the development has not been finalised, suffice it to say that any waste collection facility will need to consider accessibility and size of storage.

Whilst waste collection requirements may differ between different types/classes of business, it is anticipated that where feasible and practicable a site-wide or plot-wide waste management approach will be adopted similar to the waste handling system already operating in the Brent Cross Shopping Centre.

7.4.4 Management of Hazardous Waste

Whilst the quantity of hazardous waste that will be generated by the completed development will be very small it is nevertheless important to recognise that such waste will be produced and that measures will need to be in place for their safe management.

The presence of certain elements of hazardous waste within the household waste stream has been recognised for some time, and this has led the European Commission to consider the introduction of a Hazardous Household Waste Directive. The Directive is not yet enacted, but it is likely to be in place by the time the Application proposal commences.

Provision for the safe management of hazardous household waste will be the responsibility of the Local Authority. At this stage the extent of those measures cannot be defined, but many authorities are making initial provision for the collection of these wastes at Household Waste Recycling Centres (or CA Sites) and some of the larger bring banks.

The responsibility for the safe management of hazardous wastes arising within the Commercial Waste streams will primarily be the responsibility of the waste producer. Measures will therefore need to be put in place, which may include specific provision within any contract placed with a private sector waste management company retained to manage waste arising from the Development, or particular part of the Development.

7.4.5 Management of HealthCare Wastes

Whilst the proposed hospital will be private, it is anticipated that hospital and healthcare waste will be managed in accordance with NHS recommended practice. In line with emerging guidance this will require segregation of waste, using different receptacles, by waste type, source and treatment/disposal route into 10 separate categories.

In terms of waste management of healthcare wastes the following practices will be carried out:

- Setting targets and procedures for waste minimisation;
- Effective segregation of non-hazardous, hazardous and clinical wastes;
- Recycling of waste components including cardboard, paper, glass, toner cartridges and aluminium and steel cans;
- Reducing wasted meals to a minimum;

Management of clinical waste will be the responsibility of the producer. Clinical waste will not be disposed of with general refuse.

7.4.6 Management of Other Wastes

Other wastes that may be generated from the operational phase of the Development include liquid wastes such as cooking oils, lumber / bulky wastes and wastes from grounds maintenance and landscaping. The proposed approach for management of these additional waste types is, in general terms, as follows:

Liquid Wastes	It will be the responsibility of producers to procure appropriate liquid waste handling companies
Lumber / Bulky Wastes	Provision of lumber rooms for storage of bulky items will be considered in discussion with Council representatives
Grounds Maintenance and Landscaping	Opportunities for on-site composting will be considered. Contracts for grounds maintenance services will require that suitable landscaping material is composted

7.4.7 Options for Integrated Waste Management

At this early stage of planning and design it is difficult to identify exact arrangements for the management of waste. A wide range of design and operational factors will influence the quantities and types of waste generated and the optimum methodology for managing such wastes. It is clear that the development will give rise to significant quantities of waste and that without careful consideration the generation and subsequent management of waste could result in significant environmental and social problems.

To address these issues the applicants are currently assessing potential options for whole site management of the wastes. In particular the use of an underground vacuum waste collection system is currently being considered. Although representing a significant capital cost investment, such systems, which have been proven to be reliable and effective in mainland Europe, offer the potential to adopt a truly integrated waste management solution.

The optimum waste management strategy will ideally comply with a range of principles as follows:

- Compliance with the waste hierarchy;
- Minimal impact on quality of life;
- Minimise environmental nuisance;
- Minimise on-site storage of waste;
- Minimise waste generation;
- Maximise recycling;
- Minimise vehicle movements;
- Provide for the co-management of residential/commercial waste; and
- Allow for on-site waste treatment.

Through careful consideration of, and adherence to these principles it is envisaged that an integrated approach to waste management will be implemented throughout the development.

Subject to further environmental, economic and technical assessment one of two approaches to waste management will be adopted:

- a conventional approach based on the segregation of waste and recyclables by building occupiers and subsequent collection by the local authority or commercial waste operators depending on the type of waste;
- alternatively, a more integrated approach based on the use of an underground vacuum waste collection system may be adopted.

Brief details of the vacuum collection system are set out in the Section 7.3.2, above

7.4.8 Options for Onsite Management of Waste

The potential for the management of residual waste either on-site or in close proximity to the development is discussed in the next section. However, given that the quantities of waste recovered through segregated collections of recyclables and compostable materials is predicted to exceed 9,500 tonnes per annum for the entire development, it is important to consider how this material might be managed, either on-site or to provide a stimulus for community or private recycling enterprises. There are a range of potential options available for the collection and handling of recyclables and compostables as indicated in Table 7.2, below.

Table 7.2. Options for Management of Recyclables and Compostables

Recyclable Materials Collection and Handling	
Estates recycling (240 litre bins)	• Common practice in London (including Barnet through ECT Recycling) • Relatively low material recovery rates • Potential anti-social/environmental issues
Underground Containers	• 'Novel' solution • Will reduce anti-social issues • Higher capital cost • Requires specialist collection vehicle
ENVAC	• Can handle recyclable and residual waste
Refuse chutes	• Additional chute required for recyclables • Not widely practised • Potential for cross-contamination
Compostable Materials Collection and Handling	
Communal bins and refuse collection vehicles	• Difficult to collect kitchen waste in multi-unit residences due to odour/vermin potential • Not widely introduced to flats in Barnet
ENVAC	• Can handle compostable materials along with other waste streams (see above)
In-sink macerators	• No external collection required • High water consumption • May not be acceptable to water utilities • Capital, operating and maintenance cost implications

The predicted arisings of recyclable materials from the Primary Development Package (PDP) and the entire development are presented in Table 7.3, below.

Table 7.3. Potential Quantities of Recyclables

Material Type	Proportion of Recyclate	PDP	Entire Development
Paper	**51%**	**1,603**	**4,141**
Cardboard	**15%**	**467**	**1,206**
Glass	**4%**	**139**	**358**
Metal	**6%**	**199**	**514**
Plastic	**23%**	**734**	**1,895**
Total Recyclate	**100%**	**3,142**	**8,114**

The following options for local recycling/remanufacturing based on recycled materials may be feasible:

- Paper represents the largest proportion of recyclable material; shredding of paper is practiced by some community based schemes with resulting shredded material used as packaging material and/or animal bedding. Cardboard can similarly be shredded and used as animal bedding. However, given the location of the Development, markets for animal bedding will probably be limited.
- Opportunities for glass recycling include production of flat sheets of art glass, coasters, tiles and glass cullet for garden mulch, aggregate, fish tanks and shot blasting. Equally glass could be taken to the London Remade's Glass Recycling Centre at Greenwich.
- Opportunities for local recycling of metal are considered to be limited although any enterprise would be able to derive income from the sale of metal and in particular non-ferrous drinks containers.
- Plastics account for approximately 25% of the total weight of recyclables. The greatest barrier to plastic recycling is the need to segregate the plastics into individual polymer types to facilitate effective recycling. It is unlikely that remanufacturing of products from plastic will be economical although segregation by polymer type and subsequent selling of segregated material may be possible.

In addition to recyclable materials it is estimated that some 1,500 tonnes of compostable material could be also collected. This estimate excludes cardboard, which could be co- composted with food and green waste and green materials from grounds maintenance activities.

Options for on-site composting of food and green waste in an enclosed composting vessel will be considered, although it must be recognized that without a suitable outlet for use of the resulting composted material, on-site composting is unlikely to be deliverable or sustainable. An additional problem, should kitchen waste containing meat form part of the feedstock, will be the need to comply with the Animal By-Products Regulations which may make on-site composting impractical and unaffordable.

As a minimum the onsite composting of green waste from parks, gardens and open spaces will be practiced, with the resulting compost being employed beneficially on site.

7.4.9 Management of Residual Waste

Through implementation of various waste reduction and recycling policies and systems it is anticipated that approximately 54% of generated waste will be recovered via source-segregated recycling and composting as indicated in Table 7.4. The remaining waste, some 46% of the total, will still contain significant quantities of valuable materials that can be recovered through a suitable waste handling/treatment facility.

Table 7.4: Anticipated Recycling and Composting Performance

	Waste Arisings (tonnes per annum)		
	Household	Commercial &Industrial	Total
Recycling	**1,178**	**6,937**	**8,114**
Composting	**726**	**892**	**1,618**
Residual	**2,827**	**5,416**	**8,243**
Total	**4,731**	**13,244**	**17,975**
Recycling / Composting rate	**40.2%**	**59.1%**	**54.0%**

It is proposed that the existing Hendon Waste Transfer Station will be relocated to an adjacent site, with development of a larger Waste Handling Facility (WHF) and related energy from waste / CHP facility, incorporating a range of key elements, as noted in Section 7.3.1 above.

Introduction of these new waste and energy facilities will result in anticipated that overall recovery rates for waste generated from the development will exceed 85% (This assumes that the method of residual treatment will comprise an element of energy generation and that all suitable waste will be managed through the facility). The headline figures, which should be treated as indicative only at this time, are presented in Table 7.5, below.

Table 7.5. Headline Waste Management Performance

	PDP (tonnes / annum)	Entire Development (tonnes / annum)
Total waste arisings	**6,993**	**17,975**
Source segregated recycling / composting	**3,910**	**9,732**
Potential recovery through residual treatment *1	**2,034**	**5,547**
Clinical Wastes	**0**	**15**
Landfill *2	**1,049**	**2,681**

Notes:
*1 Based on achieving overall 85% recovery of waste
*2 Figures exclude ash and other residues from treatment of waste

The figures in Table 7.5 show that while the Development is predicted to generate some 18,000 tonnes of waste per annum, through adoption of an integrated approach, comprising high levels of source-segregated recycling and composting and further beneficial recovery via residual waste treatment, the quantity of waste consigned to landfill should be no more than 2,700 tonnes per annum.

Based on the PDP only, the quantity of waste requiring landfill will be approximately 1,049 tonnes per annum.

Table 7.6, below, provides a brief summary of the principal options for the management, treatment and disposal of waste and material streams arising from the proposed development.

One of the key issues to debate is the extent to which the waste streams will be managed on a combined basis (i.e. commercial/business waste, household waste and leisure related waste), or whether household waste would be managed on a completely separate basis. As a Waste Collection Authority the London Borough of Barnet will be responsible for the collection of municipal waste, which includes all household waste and also commercial waste where the Council is requested to do so. Similarly, as Waste Disposal Authority the North London Waste Authority (NLWA) is responsible for the provision of services and infrastructure to manage, treat and dispose of all municipal waste delivered by the constituent Waste Collection Authorities. If all of the waste from the development is managed as a combined waste stream this will have significant implications for both the WCA and the WDA.

Table 7.6. Waste Treatment and Disposal Options

Combined waste Streams
Strong support for better integration between waste streams is emerging at all levels within the waste management sector, and this is reflected in emerging Greater London Authority and UK Government policy (as noted in the DEFRA consultation document on the review of England's waste strategy). Options include: • All wastes (residual, recyclable and compostable) taken off-site for treatment, reprocessing and/or disposal at remote sites. In this scenario it is likely that a private sector waste management company will be required to provide handling, collection and transfer services; • All wastes (residual, recyclable and compostable) transferred to the adjacent NLWA Waste Handling Facility. A high proportion of the waste stream will be derived from non-household sources, and therefore will not be considered to be municipal waste for which the NLWA has a duty to manage. In this scenario there will therefore be a need for a contractual framework for the provision of capacity at the Waste Handing Facility; • Some wastes – for example residual waste and compostable waste – to be treated on-site (through some form of energy from waste for the residual stream and either composting or anaerobic digestion for the compostable elements). Recyclable waste would need to be taken off-site for reprocessing.
Separate Waste Streams
Options include: • Household waste to be collected by the WCA and managed with the municipal waste stream (either remotely or at the adjacent Waste Handling Facility); • Non-household waste streams to be collected under contract with a private sector waste management company and taken off-site for treatment, reprocessing and/or disposal at remote facilities

Notwithstanding the issues of WCA and WDA responsibility for municipal waste, the preferred option will be based on the management of wastes arising from the development under common arrangements, rather than as separate municipal and non-municipal streams. Having a common approach will provide the basis for maximising the potential value from all waste streams, and should also provide for the establishment of a simpler overall waste management framework across all parts of the development.

7.5 Minimum Design Requirements: Conventional Waste Management

7.5.1 Residential Waste

General

Waste management principles and storage provision will conform to the general requirements set out in BS5906: Waste Management in Buildings – Code of Practice:

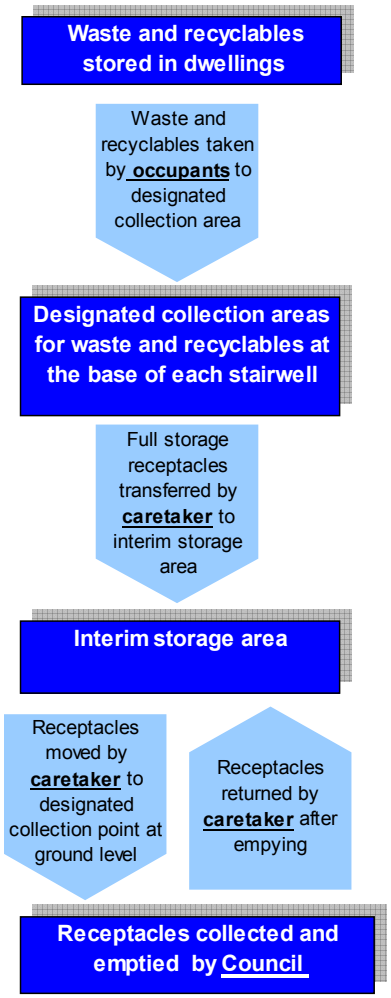
- The point collection of all components of waste by the Council and other waste collection organisations will be at street level unless otherwise advised;
- Preferred receptacles for residential buildings will be 1100 litre Eurobins;
- Waste receptacles will be provided for recyclables, organics and residual waste, and

- A suitable area and equipment will be provided to allow frequent cleansing of communal storage bins.

Waste Management Plans

A waste management plan will be drawn up for each planned residential building. The plan will establish how waste and recyclables are to be transferred from individual dwellings to the point of collection taking into consideration the design of the building and types and numbers of dwellings. Figure 7.2 indicates the preferred waste flow pattern to be adopted for multi-occupancy residential buildings.

Figure 7.2 In-building Waste Flow Path for Residential Waste



Minimum Storage Requirements

A minimum internal storage capacity of 60 litres per dwelling (flats and houses) will be provided which can accommodate 3 bins, where no single bin is less than 15 litres in size;

Minimum storage requirements for communal collection areas will be dictated by the collection frequency, to be agreed with the Council. Table 7.7, below, indicates the minimum number of 1100 litre bins to be provided per 100 dwellings based on weekly collection;

Table 7.7. Minimum Number of Euro Bins per 100 Dwellings (weekly collection)

Number of Households	Recyclables	Compostables	Residual
100	4.0	2.0	10.0

7.5.2 Commercial Waste

General

Waste management principles and storage provision will conform to the general requirements set out in BS5906: Waste Management in Buildings – Code of Practice;

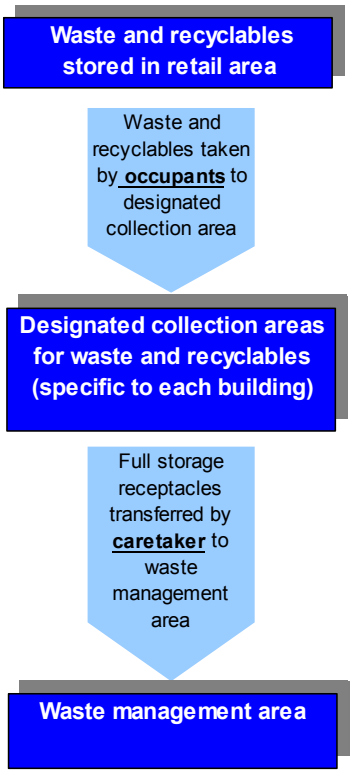
- The point collection of all components of waste by the Council and other waste collection organisations will be a designated waste management area at street level, unless otherwise advised;
- All non-residential developments above 1,000m2 floor area will be provided with a minimum of 10m2 designated waste storage space for materials for recycling, including paper, cardboard, cans, bottles and plastics;
- Waste producers will be responsible for complying with all building waste management requirements, and
- Mixed residential / commercial buildings will be provided with separate areas for management of residential and commercial waste.

Waste Management Plans

A waste management plan will be drawn up for each planned commercial building. The plan will establish how waste and recyclables are to be transferred from individual waste producers to the point of collection taking into consideration the design of the building and types and numbers of commercial operations.

Figure 7.3 indicates the recommended waste flow pattern to be adopted for commercial buildings, although alternative solutions (for example designating waste producers responsible for movement of waste to the waste management area) may be adopted.

Figure 7.3 In-building Waste Flow Path for Commercial Waste



Waste Management Requirements

The following methods for storage of waste and recyclables will be adopted.

Residual Waste	Eurobins or static compactor
Cardboard	Non-compaction enclosed container
Plastics (Film)	Compactor and Eurobin
Plastics (Rigid)	Compactor and Eurobin
Cans	Compactor and Eurobin
Glass	Eurobins or covered skip
Paper	Eurobins or covered skip
Cooking Oil	Original receptacles stored in a bunded area
Shop refits	Skip

The area allocated for management of commercial waste in each commercial building will be building specific and depend on the types, numbers and extent of commercial operations. Storage areas will be calculated for each building having regard to the types and quantities of waste anticipated to be generated and the methods of storage and disposal.

Other Requirements

Commercial buildings with access to the general public (eg shopping centres) will be provided with adequate recycling facilities to encourage segregation of recyclable packaging and drinks containers;

Commercial buildings will also be provided, where identified as being necessary, with areas for separate collection and management of healthcare wastes.

The fundamental basis of the approach to waste management is one of 'producer responsibility'. The requirement to manage waste in a sustainable manner and fully participate in building recycling schemes will be a requirement of all building leases.

Occupants, both residential and commercial, will be encouraged to abide by the principles of the waste hierarchy. To this end waste prevention will form the fundamental basis of the development wide approach to waste management;

Personnel with responsibility for waste will be employed to coordinate management of waste within buildings and ensure that all waste, and its individual components are presented in the correct format for collection.

7.6 Commitments and targets – operational waste

The Development Partners have made the following commitments regarding Municipal and Commercial waste:

- The fundamental basis of the approach to waste management is one of 'producer responsibility'. The requirement to manage waste in a sustainable manner and fully participate in building recycling schemes will be a requirement of all building leases;
- Occupants, both residential and commercial, will be encouraged to abide by the principles of the waste hierarchy. To this end waste prevention will form the fundamental basis of the Development wide approach to waste management;
- Personnel with responsibility for waste will be employed to coordinate management of waste within buildings and ensure that all waste, and its individual components are presented in the correct format for collection;
- Waste personnel will also play an active part in raising awareness and ensuring that occupants comply with the required waste management procedures;
- Residential buildings will be provided with facilities to recycle or compost at least 40% of household waste by means of separated dedicated storage space. Ability to achieve higher recycling / composting performance will, however, not be precluded by the design and nature of the waste management infrastructure;
- All residential buildings will be provided with facilities, suitably sized, for the separate collection of recyclables, organics and residual wastes;
- Facilities will be provided to recycle and compost 60% of commercial and industrial waste with an aspirational target of 70% by 2020;
- Commercial buildings will include storage space for segregated waste enabling the waste producers and contractors to recycle this as easily as possible;

- The design of waste storage and management infrastructure will be in accordance with 'best practice' design;
- Compostable waste will be segregated for composting. Green waste from parks, gardens and open spaces will be composted locally, and used beneficially on site;
- Recycling facilities will be as easy to access as waste facilities, and
- Headline waste management performance, based on the above commitments, is summarised in table 7.8, below:

Table 7.8 Headline Waste Management Performance

	PDP (tonnes / annum)	Entire Development (tonnes / annum)
Total waste arisings	**6,993**	**17,975**
Source segregated recycling / composting	**3,910**	**9,732**
Potential recovery through residual treatment 1	**2,034**	**5,547**
Clinical Wastes	**0**	**15**
Landfill 2	**1,049**	**2,681**

Notes:

1 Based on achieving overall 85% recovery of waste

2 Figures exclude ash and other residues from treatment of waste

8 Addressing global and local environmental impacts

8.1 Climate Change

8.1.1 Changes predicted for the London Climate

Climate change over the next few decades is likely to have a significant impact on the climate of London. The latest set of climate change scenarios for the UK is set out in the report by the UK Climate Impact Programme UKCIP02 scenarios. These include projections of how the climate might be in all regions of the United Kingdom for a range of future socio-economic scenarios for the 2020s, 2050s and 2080s. The scenarios do not precisely address the London area in detail, nor the climatic impact of the unknown future land use in London. Further, the computer models currently used to produce the scenarios assume the whole land surface to have a rural land use (i.e. vegetated). The key results from this report are as follows

Key results

- *UK climate will*[1] *become warmer.* By the 2080s, annual temperature averaged across the UK may[2] rise by between 2ºC for the Low Emissions scenario and by 3.5ºC for the **High Emissions** scenario. There will be greater warming in the south and east than in the north and west, and there may be greater warming in summer and autumn than in winter and spring. By the 2080s for the **High Emissions** scenario, parts of the southeast may be up to 5ºC warmer in summer. The temperature of UK coastal waters will also increase, although not as rapidly as over land.
- *High summer temperatures will become more frequent and very cold winters will become increasingly rare.* A very hot August, such as experienced in 1995 when temperatures over central England averaged 3.4ºC above normal, may occur one year in five by the 2050s for the Medium-High Emissions scenario, and as often as three years in five by the 2080s. Even for the Low Emissions scenario, by the 2080s about two summers in three may be as hot as, or hotter than, the exceptionally warm summer of 1995.
- *Winters will become wetter and summers may become drier everywhere.* The relative changes will be largest for the **High Emissions** scenario and in the south and east of the UK, where summer precipitation may decrease by 50 per cent or more by the 2080s and winter precipitation may increase by up to 30 per cent. Summer soil moisture by the 2080s may be reduced by 40 per cent or more over large parts of England for the **High Emissions** scenario.
- *Snowfall amounts will decrease throughout the UK.* The reductions in average snowfall over Scotland might be between 60 and 90 per cent (depending on the region) by the 2080s for the **High Emissions** scenario.
- *Heavy winter precipitation (rain and snow) will become more frequent.* By the 2080s, winter daily precipitation intensities that are experienced once every two years on average may become between 5 per cent (Low Emissions) and 20 per cent (**High Emissions**) heavier.
- *Relative sea level will continue to rise around most of the UK's shoreline.* The rate of increase will depend on the natural vertical land movements in each region and on the scenario. By the 2080s, sea level may be between 2 cm below (Low Emissions) and 58 cm (**High Emissions**) above the current level in western Scotland, but between 26 and 86 cm above the current level in southeast England.
- *Extreme sea levels will be experienced more frequently.* For some east coast locations, extreme sea levels could occur between 10 and 20 times more frequently by the 2080s for the Medium-High Emissions scenario than they do now.
- *The Gulf Stream may weaken in future and the changes in climate described in this report reflect this.* It is unlikely that this weakening would lead to a cooling of UK climate within the next 100 years. We do not understand enough about the factors that control this ocean circulation, however, to be completely confident about this prediction, especially in the longer term.

The principal climate changes identified for the London Region by the UKCIP02 scenarios are likely to be:

- increased maximum and minimum daily average temperatures, with the change in the minima being slightly smaller than the maxima, resulting in a slightly increased diurnal temperature range;
- small decreases in wind speeds (<10%);
- moderate changes in solar irradiance (of up to 20%). These changes are due to a reduction in cloud cover – i.e. more sunny days rather than an increase in peak solar irradiance;
- decreases in Relative Humidity in all seasons, particularly in summer (up to 15% decrease). Although Relative Humidity (which changes according to temperature) is projected to decrease, Specific Humidity (absolute air moisture content) is projected to increase, and
- A moderate increase in winter precipitation (rainfall) (up to 26% increase) and a more marked decrease in summer precipitation (up to 54% decrease).

8.1.2 Levels of confidence in the predictions for climate change

In applying and interpreting the climate change scenarios for the UK and for London specifically, the inherent uncertainty in the scenarios needs be acknowledged. The sources of uncertainty are both the computer models of the climate behaviour themselves, and assumptions about future levels of Greenhouse Gas emissions (influenced by global fossil fuel consumption, economic and population growth rates). Because of these uncertainties, the confidence that can be placed in the scenarios for different climate variables varies (Table 8.1).

Table 8.1: Levels of confidence for projected changes in key climate variables that are important for the development of extreme urban heat island events.

Climate Variable	Level of Confidence
Temperature	High confidence in average annual change but low confidence in seasonal variation of change and changes in diurnal range.
Wind speed	No confidence (highly uncertain results)
Solar irradiance & cloud cover	Low confidence
Relative humidity	Medium confidence
Precipitation	High confidence for winter changes but low confidence for summer changes

8.1.3 Likely impacts of climate change on development of the built environment, and measures to meet them

While the precise nature and magnitude of the changes to the London climate are uncertain, the following measures (Table 8.2) will be taken, subject to the results of later studies by the UKCIP and other climate change research programmes.

Table 8.2: Measures proposed to meet impact of climate change.

Feature of built environment	Likely impacts of climate change on Masterplan and building design	Measures to meet the predicted impacts
Energy & internal comfort	Less heating needed in winter More cooling needed in summer.	Lower demand for heating energy in winter is likely to be offset by higher demand for cooling in summer. It will not be unreasonable for building occupants to need to tolerate more days per year when internal temperatures are higher than the ideal.
Building fabric	Use of passive cooling methods in warmer summers	Using the thermal mass of buildings can be an effective way of achieving passive cooling in buildings. However, this technique will need to be balanced against the greater contribution to the Urban Heat Island made by buildings with high thermal mass. Buildings at BXC will incorporate passive cooling methods when these are appropriate to the uses of the buildings, and with regard to possible adverse environmental consequences.
Building facades	More sunny days per year, especially in the summer. More instances per year of high winds.	With more sunny days, it is likely that there will be a greater need to use external shading or glass that counteracts solar. The larger number of sunny days will also make the use of photovoltaic façade panels to generate low-voltage electricity more viable. Although there are predicted to be more days a year with high winds, it is not expected that the magnitude of these winds will be higher than those currently used when designing building facades. Buildings at BXC will be designed to make most effective use of the façade to reduce solar gain, to incorporate photovoltaic façade panels to generate low-voltage electricity when this is a viable and environmentally beneficial solution.
Water use	Lower rainfall in summer	The main effect is likely to be increases charges for potable water. This will encourage the designers of buildings to collect grey water and either use it internally, or sell it for external uses such as street cleaning or irrigation. The Water Resource Efficiency Strategy outlines the measures proposed for reducing demand for potable water at BXC.

Continued . . .

Feature of built environment	Likely impacts of climate change on Masterplan and building design	Measures to meet the predicted impacts
Landscaping and microclimate	More sun, higher temperatures and lower rainfall in summer.	The use of vegetation in landscaping provides a convenient means of moderating the local microclimate, both by providing shading and evapotranspiration; it also helps mitigate the Urban Heat Island Effect which will be aggravated by warmer summers. The types of plants proposed for landscaping at BXC will be chosen to reflect the likely changes to the climate. The use of vegetation at BXC will be balanced against the increased need for irrigation in warmer summers. It is proposed that irrigation water will be provided by harvesting rainwater.
Drainage	More rainfall in winter. Less rainfall in summer.	Increased rainfall in winter is likely to place greater load on the drainage systems. The attenuation measures proposed for BXC, outlined in the Sustainable Urban Drainage Strategy, will cater for this predicted increased load. Lower rainfall in summer may mean that insufficient water will be available to flush drains. If this is identified as a problem, the water-use and drainage strategy for the site will be revised to prevent it.

8.2 Urban Heat Island Effect

The principal causes of the urban heat island are the storage by day of solar energy in the urban fabric and release of this energy into the atmosphere at night, and the fact that the process of urbanisation alters the balance between the energy from the sun used for raising the air temperature (heating process) and that used for evaporation (cooling process) because vegetated surfaces are replaced by impervious engineered ones. Given this, strategies for tackling the root causes of the UHI need to focus on controlling the absorption and release/escape of heat from the urban fabric and tipping the balance between the apportionment of available natural energy between heating and cooling of the urban atmosphere.

8.2.1 Likely impacts of UHI effects on development of the built environment, and measures to meet them

To manage London's urban heat island form and intensity would require the alteration of existing land cover characteristics for large areas of central London. From a practical point of view this is not possible. However there are opportunities to change microclimates and therefore manage climates at the street canyon to neighbourhood scale. Effective strategies that can be implemented within the context of the existing urban structure and have impacts at the local and near local scale include cool roofs, green or brown roofs, planting trees and vegetation and cool pavements (See Table 8.3).

Table 8.3: Mitigation measures proposed to meet impact of urban heat Island effect.

Mitigation measure	Comment	Commitment at BXC
Cool roofs	Dark roofs in London probably reach temperatures in excess of 50-60°C on hot sunny days and store and release a considerable amount of energy back into the atmosphere. High roof temperatures contribute to increased demand for cooling energy and a decrease in indoor thermal comfort on upper floors. Cool roofs built from materials with high solar reflectance or albedo and high thermal emittance may reach temperatures considerably lower than their low reflectance counterparts.	The potential beneficial effects of cool roofs will be modelled when individual buildings are designed and incorporated as appropriate.
Green Roofs	On hot sunny days the temperatures of green roofs may be up to 20-40 o C cooler than a conventional flat dark coloured roof. They can thus achieve similar benefits to cool roofs.	10% of the roof space will have green or brown roofs.
Planting Trees and Vegetation	'Urban Greening' can be a cost effective way of ameliorating harsh urban climates at the individual building to neighbourhood scale. Trees and vegetation are good modifiers of climate, as they not only provide shade (surface peak temperature reductions of 5-20°C may be possible) but are natural cooling systems as they consume large amounts of available energy in the atmosphere through the process of evapotranspiration.	A considerable amount of trees and vegetation are to be incorporated into the development. Details of the planting proposed at BXC are given in the Open Space Strategy and Parameter Plan 003.
Cool Pavements	The installation of 'cool pavements' comprising materials with high solar reflectivity and good water permeability is potentially an effective way of mitigating high urban temperatures through decreasing absorption of solar energy and encouraging water storage in the urban surface and thus evaporative cooling.	The potential beneficial effects of cool pavements will be modelled when individual buildings are designed and incorporated as appropriate.
Sky view factor	Sky view is an important determinant of the rate of release of heat from the urban environment at night and thus the rate of urban cooling. For this reason new developments should optimise sky view and consider street orientation.	No narrow streets bordered by tall buildings on both sides are proposed at BXC. The North Circular Road and several major streets at BXC (e.g. the main street linking the proposed Market Square and Brent Cross Tube station) are approximately aligned with the direction of the prevailing wind.
Heat wave detection and preparedness	In parallel with the application of engineering options for managing the urban heat island are plans to reduce the health risks of hot weather by setting out the practical actions that the public, health and social care professionals should take in the event of a heatwave. The national Heat Wave Plan published by the Department of Health has been implemented locally.	It is expected that the London Borough of Barnet will implement the national Heat Wave Plan.

8.2.2 Impact of climate change on UHI effects

Climate change is likely to have a major impact on the climate of London and potentially could affect both the frequency of occurrence and magnitude of extreme UHI events.

As discussed in Section 8.1.2, there are varying levels of confidence with which the various variables can be predicted that affect UHI events, such as received solar radiation, cloud cover and wind speed. This makes predicting future values of the UHI intensity inherently difficult.

Accordingly, the GLA's published guidance on the Urban Heat Island effect concludes that the changes described by the UKCIP02 scenarios should be taken to be representative of changes to the rural climate surrounding London and outside of the zone of influence of the UHI.

8.3 Reducing impacts due to pollution, noise, and microclimate effects

An Environmental Impact Assessment of the proposed development has been undertaken. The Environmental Statement, submitted with the outline planning application, reviews the full range of predicted impacts and suggests various measures by which the magnitude of these impacts will be mitigated.

The main issues are as follows and full details of anticipated environmental impact, and the measures to be taken to mitigate these impacts are given in the Environmental Statement and accompanying technical studies.

8.3.1 Contaminated land and groundwater

The development site has a long history of industrial processes and there is considerable contamination to the land and ground water. The main areas are identified in the Supplementary Planning Guidance on the Cricklewood, Brent Cross and West Hendon Regeneration Area Development Framework (London Borough of Barnet, December 2005).

The measures to be taken to deal with this contamination, and prevent it being carried by ground water to other parts of the site are dealt with in two reports on Contaminated Land and Groundwater issues at BXC.

8.3.2 Pollution of the atmosphere

Oxides of nitrogen

All boilers used to deliver heat will have NOx emissions of less than 70 mg/kWh at 0% excess oxygen.

Ozone-depleting substances

No materials proscribed in the Montreal protocol will be used in the construction of fit-out of buildings. In particular, materials used as refrigerants or insulation will have an Ozone Depletion Potential (ODP) of zero.

Substances that lead to global warming

All refrigerants and insulation materials used in buildings will be required to have a Global Warming Potential of 5 or less.

Developers of individual buildings will implement measures to reduce the use of petroleum fuelled cars. These will be agreed with the local authority when planning permission is sought, and ensured by means of an agreed Travel Plan. Measures are likely to include provision of cycle parking and storage, the use of car pools, and, when the demand arises, providing charging points for electrically-powered vehicles.

Volatile organic compounds

Inert and low emission finishes, construction materials, carpets and furnishings should be used wherever practical. Inert and low emission materials will be used throughout the development wherever practical.

8.3.3 Noise

The adverse impacts of noise will be minimised, when buildings are designed in detail, using measures at source or between source and receptor in preference to sound insulation at the receptor, wherever practicable. This will include the choice and location of plant and the methods and layout of screening and sound absorption.

For residential development BS 8233:1999 (Table 5) 'good' standards will be achieved for external to internal noise; Building Regulations (2003) Part E concerning internal sound transmission standards will be exceeded by 5dB.

8.3.4 Microclimate

A wind study of the development site will be undertaken and appropriate mitigation measures taken to ensure that the Lawson criteria for wind comfort and safety are met. Details of how this will be achieved are given in the Chapter on microclimate in the Environmental Statement (Volume BXC 2).

8.4 Building Environmental Performance

Various measures to reduce the environmental impact of the proposed development are described throughout this Strategy. These are further augmented in the mitigation measures described in the Chapters of the Environmental Statement.

At the level of individual buildings, their environmental impact and building performance will be assessed using the appropriate environmental assessment tool. Details of these, and the minimum standards to be achieved are presented in Table 8.4, below.

Table 8.4: Minimum environmental performance standards for buildings.

Building type	Assessment method	Minimum performance standard to be achieved
Commercial office	BREEAM for Offices	Equivalent to a "Very Good" rating using BREEAM for Offices 2006.
Residential buildings	Code for Sustainable Homes	3* rating under the Code for Sustainable Homes (2007).
Other buildings	Bespoke BREEAM	Equivalent to a "Very Good" rating at 2006 standards.

Deleted: 2

It is recognised that the details of these assessment tools are likely to change over the twenty years period during which the development will be constructed. The Development Partners are committed to using these (since they will supersede current versions) to set levels minimum levels of building performance that correspond to those needed to achieve the "Very Good" rating using 2006 versions of the tools.

It is recognised that Building Regulations are likely to become more demanding, especially in the minimum standards they require for carbon dioxide emissions and water use. Also, subject to the outcome of current government consultation on the implementation of the new Code for Sustainable Homes, it is possible that it may become a requirement for all residential buildings to achieve a certain Star-rating using the new Code for Sustainable Homes, and that they achieve a minimum threshold for carbon dioxide emissions between now and the year 2016.

The designers of buildings throughout the period of constructing the development will be required to meet the current Building Regulations and other relevant standards that are current when the buildings are built.

8.4.1 The environmentally-responsible "exemplar" building

In addition to the various measures for reducing environmental impact proposed for the development as a whole, an exemplar sustainable building will be constructed as part of the BXC development. This will demonstrate the very best practice in sustainable design and construction, especially with regard to:

- use of reclaimed components and construction materials;
- use of new and recycled materials;
- energy efficiency and low emissions of carbon dioxide, and
- low water use.

The proposed exemplar building at BXC will be designed in response to the GLA's policy that every London Borough shall have a building that demonstrates the very best environmental sustainability practice in design and construction.

A key objective of the building is not only that it shall be an exemplar building but also that it shall be seen to be one. Information about the building and how it operates will be made available to the public, for example via a website; this could include a real-time display of the reduced carbon dioxide emissions compared to a similar conventional building.

It is proposed that the Claremont Primary School will be the exemplar building. The choice of a school building will have the advantage of introducing the ideas of environmental sustainability into an educational environment. The building will achieve an “Excellent” rating under BREEAM-for-Schools.

9 Further Strategies addressing Environmental Sustainability

Environmental sustainability is addressed in several other documents submitted in support of the planning application. The following sections present summaries of the following documents as they relate to environmental sustainability:

- Public Realm and Open Space Strategy (Volume BXC 7);
- Transport Assessment (Volume BXC 5), and
- Sustainable Urban Drainage Strategy (SUDS) (Volume BXC 15).

9.1 Sustainability and the Open Space Strategy

9.1.1 Introduction

The Development Partners are aware of the opportunities at BXC for creating a positive environmental impact by means of enhancements to the local ecology and habitats. The Public Realm and Open Space Strategy provides details of the means by which this positive impact will be achieved. This strategy has been developed by giving regard to the following objectives.

- Reducing waste and flows of waste to landfill in a resource-efficient society;
- Reducing the need to travel and providing sustainable alternatives to private car use;
- Optimising the use of materials, in terms of their source and their performance;
- Maximising opportunities for use of local food supplies;
- Reducing water consumption;
- Protection of the natural environment and the habitats it offers to flora and fauna;
- Protection of the cultural heritage and the sense of local and regional identity;
- Promoting equity and fair trade within the community, and
- Promoting well-being and health lifestyles.

The measures proposed at BXC for achieving these objectives are summarised in Section 9.1.4.

9.1.2 Planning Policy and Guidance

The Public Realm and Open Space Strategy has been developed with regard to the following key regional and local policies:

- The London Plan: Consolidated with Alterations since 2004 (GLA, February 2008);
- GLA Policy 3D.12 (Biodiversity and nature conservation);
- Barnet Policy D11 (Landscaping);
- Barnet Policy D12 (Tree Preservation Orders);
- Barnet Policy D13 (Trees and Development Proposals), and
- Barnet Policy D14 and D15 (Hedgerows).

Further guidance that has been consulted in developing the Strategy has included:

- GLA Development Plan Policies for Biodiversity – Best Practice Guidance of the London Plan, November 2005;
- The GLA's SPG on Sustainable Design and Construction (GLA, May, 2006), and
- London Borough of Barnet Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006).

9.1.3 Biodiversity & Natural Habitats

An important factor in the successful implementation of a sustainable development is the incorporation of a comprehensive range of natural habitats.

- Educational resource – access & interpretation;
- Ecological resource – improved habitat & biodiversity;
- Improve residents' understanding of the natural environment, and
- Recreational resource – pedestrian & cycle routes.

This provision will be achieved in a number of ways and has been designed to ensure that there is a robust framework of larger habitat areas linked by a network of green corridors. Designated areas for ecology will be provided throughout the development area, either as an independent open space area or as part of a park, garden or other open space. A variety of natural habitats will be provided to optimise biodiversity and to suit the specific local conditions, and they will be spread throughout both the public and private open spaces.

- Broadleaved Woodland;
- Riparian;
- Grassland;
- Roof Gardens;
- Wastelands;
- Public Amenity Spaces;
- Hedgerows, and
- Gardens.

The UK's commitment to biodiversity, or "the variety of life on earth," is represented by a series of biodiversity action plans (BAPs) that operate from a national level down to a local level. These plans identify habitats and species to be protected, along with targets for conservation. The London Biodiversity Action plan has therefore been referenced in the development of the different habitat types noted above, and the open space strategy ensures that local biodiversity is conserved and improved through the choice of species and new habitats that will be created.

The choice of plant species is based on the local habitat types as recognised by the National Vegetation Classification. On the north London clay soils, the dominant woodland type is a hornbeam mix, with oak, ash, field maple and crab apple also featuring. This native woodland type, and its associated species, forms the underlying structure to the planting palette in order to ensure that the local biodiversity is respected and improved.

The procurement and propagation of local plant material could form the basis of a tree nursery and local seed bank project involving local schools and community groups. At a local level, there will be opportunities to involve

the community with Tree Warden Schemes and garden bird watch groups, for example, to ensure that there is participation in monitoring change and auditing local biodiversity.

Tree Strategy

An assessment of the existing tree provision within, and adjacent to, the development site was carried out in order to identify both individual and groups of trees that made a significant and positive contribution to the landscape character of the area, including identifying any existing trees subject to a Tree Preservation Order. An arboricultural survey was also carried out to identify the size, species, worth and health of all of the existing trees within the development site. With this in mind, a tree strategy has been developed that identifies the approximate location of existing trees to be retained (as shown on plan Ref: 823-MD-049 in document Drawings and Plans BXC1), as well as the strategy for replacement and new planting (as shown on plan Ref: 823-MD-049 in document Drawings and Plans BXC1 and described in the Public Realm and Open Space Strategy BXC7).

There is limited street tree planting through many of the residential areas, with the exception of Pennine Drive. Where trees do exist, they are often in poor condition and include a variety of species. The outcome has been the creation of an often hard and unattractive environment with little inherent visual quality. The exception is Pennine Drive, where mature tree planting provides a more distinct and attractive appearance. However, even here the trees are often in poor health and of a variety of species.

Wherever possible, existing trees of significant value have been retained, for example the Clitterhouse Playing Fields boundary. However, where this has not been possible, replacement planting has been proposed, using species and locations that reflect the trees lost, wherever appropriate. New tree planting will form an integral part of the overall planting strategy and will include the following:

- Avenue planting along primary vehicular, cycle and pedestrian routes;
- Screen planting alongside A406 North Circular and A41 Hendon Way;
- Screen planting between residential areas and Clitterhouse Playing Fields;
- Native tree planting in Nature Parks and along River Brent Corridor;
- Native tree planting within Green Corridors, and
- Tree planting within communal courtyards & home zones.

9.1.4 Approaches to delivering sustainability through ecology and habitat creation

The following measures are proposed for BXC in order to achieve the aims for enhancing the habitat and biodiversity.

Objective	Measures proposed at BXC
Minimising CO2 emissions from heating, cooling and powering our buildings	• Provision of green walls for insulation, wherever possible and appropriate • Provision of planting to create comfortable micro-climates • Provision of green and brown roofs to provide thermal insulation to buildings • Low energy lighting solutions
Minimising waste and flows of waste to landfill in a resource-efficient society.	• Re-use of recycled materials wherever possible • Re-use of site arisings in landscape areas, for instance ground profiling in new parks, and profiling of Brent Terrace Park in particular. • Introduce community composting facilities • Compost green waste arising from park maintenance • Felled trees and cleared vegetation - chipped and re-used as mulch • Creation of log pile stacks in nature parks • Re-use existing concrete hard standing as ballast for green/brown roof systems
Reducing the need to travel and providing sustainable alternatives to private car use	• Provision of comprehensive and attractive cycle and pedestrian routes throughout the development, and provision of extensive and new links to areas beyond development site, to encourage more non-car based journeys.
Optimisation of use of materials, in terms of their source and their performance	Materials - General Principles • Minimise the quantities of materials used and avoid use of scarce materials • Use materials with low embodied energy wherever possible • Avoid using materials that have adverse impacts on people on the environment. • Use recycled materials, and materials capable of being recycled wherever possible. • Reclaimed or recycled materials will be used, and specifiers will be expected to make use of best-practice guidance and product information regarding recycled-content building products. The WRAP Re-cycled content Toolkit will be used to help monitor recycle content and establish best practice. • Avoid and reduce the production of waste, both during construction and operation facilities • Reduce waste sent to landfill by recycling. Hard Landscape and Street Furniture: • Materials for the hard landscaping will be chosen with regard to the overall sustainability of a development. • Use of recycled/reclaimed materials e.g. from demolition • Use of recycled-content products • Use of materials that can be reclaimed or recycled • Use of materials with long life and low maintenance requirements • Use of locally sourced materials/components to reduce transport needs • Use of materials that have low energy input manufacturing methods • Use of timber from a certified, sustainable source - e.g. FSC systems

	• Use of permeable paving solutions, whenever possible • Minimisation of light pollution through the use of low-energy lighting solutions Soil • The use of imported, non-manufactured topsoil is becoming increasingly expensive and unsustainable. Therefore, there will be a preference for the use of locally sourced, manufactured topsoil. • Use of insitu soils, where possible, ameliorated to required standard. • Use of existing soils, from elsewhere on development area, ameliorated as required. • Use of locally sourced soils, ameliorated • Use of water retention ameliorants. • No peat or natural weathered limestone will be used in buildings or landscaping. • Use of organic locally sourced composts as ameliorants
Maximisation of opportunities for use of local food supplies	• Improvements to access to existing allotments • Promotion of mini-allotments on roof top terraces • Promotion of food box deliveries • Promotion of farmer's markets at Market Square • Potential to create mini-allotments in Brent Terrace Park
Minimisation of water consumption	Measures to be taken to maximise the efficiency with which water resources are used include the following: Sustainable Urban Drainage Strategy • It is intended to reduce the run-off rate by accommodating and managing the flow through the use of SUDS to control the quantity and quality of the discharged water. All the SUDS techniques recommended by the Environment Agency have been considered in term for both the economic and environmental benefits they will contribute to the development. • Due to the site parameters, topography, location and the availability of the systems the opportunities to reduce the surface water run-off at the Brent Cross Cricklewood site are limited. Nevertheless, through the careful selection and location of SUDS features, it is believed that the discharge can be reduced to approximately 75% of the current 1-in-100 year return period flow. Living/Green Roofs • Source control features such as living/green roofs and brown roofs are considered by this strategy. Alternatively, roofs can be used as an additional living space with paved areas that may include a permeable surface and can be incorporated as part of a water-harvesting regime. It is anticipated that up to 10% of the development's available roof area could be used. Swales • Although an infiltration feature, swales are included in this study. Swales are ditches with broad bases and gently sloping sides where surface water is able to spread over a vegetated area and percolate through the soil. However, due to the poor infiltration at the site, it is proposed that these features are only sited where adequate green space is available to allow for the maximum wetted perimeter for percolation aided by evapotranspiration, through vegetation, and evaporation to aid the low infiltration rate. Permeable paving • Permeable paving, a filtration device, is proposed for the site and included a granular sub-base which can purify surface water through microbial action. The depth of the granular sub-base can be increased to suit storage requirements and could be supplemented with thin cellular storage or drainage blankets which would be wrapped in an impermeable membrane.

	• Permeable paving is an ideal solution for the provision of SUDS where large hard paved landscapes are proposed. • 10% of rainwater to be collected for use in irrigating site. • Use of drought tolerant and native plant species
Protection of the natural environment and the habitats it offers to flora and fauna	• Existing habitats will be protected and enhanced, whenever possible. • An extensive network of green corridors and nature parks is to be provided to promote nature and biodiversity within the development to supplement existing habitats. • Native plant species are to be used wherever possible, based upon relevant NVC classification • Provide bat and bird boxes in park areas, and bird boxes within green walls where provided. • Wildlflower swards to be provided in lieu of amenity turf wherever possible • Provision of green/brown roofs for habitats
Protection of the cultural heritage and the sense of local and regional identity	• Proposals for planting, and materials strategies which build upon the natural characteristics, history and culture of the development area and surrounding communities in order to promote a strong sense of place and identity. • Creation of new civic spaces where cultural events can take place, and different cultures can meet and express themselves.
Promoting equity and fair trade within the community	• Installation and maintenance of extensive new public realm and open space areas will provide equitable opportunities for job creation within all sectors of the community. • Creation of attractive public realm for use by all sectors of society and where new and existing communities can meet.
Promoting well-being and health lifestyles	<u>Permeability and Links</u> • Provision of comprehensive and attractive cycle and pedestrian routes throughout the development, and provision of extensive and new links to areas beyond development site to minimise need for car travel, and to promote a healthier lifestyle. <u>Recreational Routes</u> • Provision of recreational routes throughout the development <u>Green Space</u> • Provision of extensive network of open space including parks, city gardens, and nature parks to provide attractive setting to development and to promote contact and benefits of contact with nature and a 'green' and attractive environment. <u>Sport and Recreation Facilities</u> • Provision of extensive sport and recreation facilities throughout the development both formal and informal <u>Food Provision</u> • Provision of mini-allotments on roof terraces and, possibly, at Brent Terrace Park. <u>Play Provision</u> • Provision of extensive play facilities through the development <u>Microclimate</u> • Ensure external environment is health and 'comfortable' by using planting to provide shade and to reduce adverse wind effects where appropriate. The use of green walls will reduce dust and promote healthy micro-climates

9.2 Sustainability and the Transport strategy

9.2.1 Introduction

The Development Partners are committed to using the opportunity of the regeneration of the BXC site to make major improvements to the public transport network in the area and to make great improvements to the pedestrian and cycle routes.

The fundamental principles underling the sustainable transport strategy are as follows:

(a) To reduce emissions of carbon dioxide and air pollutants from vehicles by:

- reducing the need travel;
- increasing the numbers of people carried in each vehicle;
- encouraging walking and the use of bicycles;
- encouraging the use of car clubs and car sharing schemes;
- minimizing congestion (when emissions are at their worst), and
- promoting the use of vehicles with lower emissions per passenger.

(b) To improve social amenity by:

- providing good public transport services;
- improving permeability both within the development area and between the development area and adjacent regions, and
- making streets and open spaces more attractive to pedestrians by good traffic management and minimizing the provision of on-street parking.

In developing the Brent Cross Cricklewood development proposals the provision of a comprehensive, sustainable transport system has been fundamental to meeting the key objectives of both National and Local Government Policy, by:

- minimising the need to travel to this centre by private car;
- maximising accessibility by public transport, walking and cycling, and
- creating a mixed use high density urban environment, that will minimise unnecessary and undesirable private car trips within the local community.

As a result, the new and improved transport infrastructure will not only provide for the residents and users of the development but will also significantly improve local and strategic accessibility for residents of adjoining communities, providing this area of north-west London with high quality public transport facilities.

Overall, the development proposals for this area has been shaped by the provision of public transport access to the site, car parking is constrained in order to encourage visitors to arrive by public transport, on foot or by cycle.

Whilst the Transport Strategy has been based mainly on maximising the provision of public transport access to the site, car parking is also constrained in order to encourage visitors to arrive by public transport, on foot or by cycle.

Transport provision for the site includes a combination of providing new transport infrastructure together with improvements and enhancements to existing services. The detailed proposals have been developed to cater for two separate but complimentary levels of access:

- strategic access, to provide for a high number of trips to and from areas outside of the immediate locality; and
- community access, to provide connections with the surrounding area and permeability within the new urban centre.

A Framework Travel Plan has been developed for the whole site, by means of which the transport objectives will be implements. For each individual commercial building, separate Travel Plans will be developed and implemented by building users.

9.2.2 Planning Policy and Guidance

National Policy

The principal national transport policies that relate to the BXC site are contained in the following documents:

- A New Deal for Transport: Better for Everyone (DfT, July 1998);
- Managing Our Roads; (DfT, July 2003);
- The Future of Transport: A Network for 2030 (DfT, July 2004);
- The Future of Rail (DfT July 2004)
- Planning Policy Statement 1: Delivering Sustainable Development (February 2005);
- Planning Policy Statement 6: Planning for Town Centres (March 2005);
- Planning Policy Statement 3: Housing (November 2006); and
- Traffic Management Act 2004.

Regional Policy

The principal regional transport policies that relate to the BXC site are contained in the following documents:

- Regional Planning Guidance for the South East (Government Office for the South East et al, July 2004);
- The London Plan: Consolidated with Alterations since 2004 (GLA, February 2008), and
- The Mayor's Transport Strategy (Greater London Authority, July 2001).

Local Policy

The principal local transport policies that relate to the BXC site are contained in the following documents:

- London Borough of Barnet Unitary Development Plan (UDP) (March 2001) through to Adopted Modifications (December 2005);
- Additional Chapter to London Borough of Barnet Unitary Development Plan (January 2003);
- Cricklewood, Brent Cross and West Hendon Regeneration Area Development Framework (London Borough of Barnet and the Mayor Of London, December 2005), and
- London Borough of Barnet Draft Local Implementation Plan (2006).

9.2.3 Sustainable transport measures

The development proposals at BXC will be supported by an Integrated Transport Strategy (ITS) that will be instrumental in delivering the aspirations for regeneration and sustainability within the BXC site. The ITS represents a comprehensive and achievable plan for delivering the transport vision that was articulated in the Cricklewood, Brent Cross and West Hendon Regeneration Area Development Framework.

Existing residents in the local community and the users of the BXC will benefit from the creation of a highly accessible and sustainable mixed residential, business and town centre development together with the improvements to public transport, walking and cycling facilities.

The Integrated Transport Strategy is based on maximising public transport access to the site, whilst at the same time, constraining car parking to encourage visitors to arrive by public transport, on foot or by cycle.

The Integrated Transport Strategy recognises that the private car will continue to be a significant mode of travel in the development area, and aims to make suitable provisions for a modest amount of additional car travel whilst making substantial provisions for the bulk of additional travel to be undertaken using alternative modes. The principal themes of the Integrated Transport Strategy are as follows.

Travel by rail

Rail is seen as important means of catering for longer distance movement to the BXC site, and new provisions will include: a New Cricklewood Station on the Midland Main Line railway; improvements to the Brent Cross Underground Station; a rail-linked Waste Handling Facility; and a Rail Freight Handling Facility. Access to the existing Cricklewood Station will also be improved - there are no plans to close it at this stage, although the frequency of trains stopping at the station may change in the future.

Travel by bus

Buses are seen as the principal means of catering for short to medium distance travel to the BXC site, as well as orbital movements, and improvements to the bus network will include several new services including extensions and alterations to existing services; new bus stops; improved waiting conditions at bus stops; infrastructure to enable the future introduction of a bus-based rapid transit system.

Interchange between travel modes

Efficient interchange between modes is seen as a key to integrating the various transport modes into a single network, and new transport interchanges will be provided at Brent Cross Bus Station and the Transport Interchange and existing transport interchanges will be refurbished and expanded.

Walking and cycling

Walking and cycling are seen as the principal means of catering for short distance trips and generous pedestrian footways and cycleways will be provided together with safe and secure crossing points, and full integration into the wider networks in the surrounding urban areas.

Road capacity

The approach to the provision of road capacity is to ensure that it will be adequate to meet the demand that it is intended to cater for but will not be excessive such that it would create unnecessary additional demand.

Car parking

Car parking provision and management is seen as the principal means through which to prevent excessive use of cars in the area, and for some uses' demand for car parking will exceed supply. This, combined with controlled parking zones, will lead to many users switching from car travel to other modes of transport.

Travel plans

A comprehensive system of travel plans and management policies will augment these themes and will encourage behavioural changes towards increased sustainability in transport choices. This will help the achievement of the gains in the switch from car to other modes of transport. The travel planning system will embrace all land uses and trip types and will regularly monitor transport provision and usage. A summary of the Framework Travel Plan is given below.

Servicing and delivery trips

A servicing and delivery strategy will reduce the impact on the human and physical environment of servicing and delivery activity by seeking to gain control and influence on servicing and delivery activity to achieve a reduction in the volume of servicing and delivery trips; a change in the pattern of servicing and delivery trips; a shift of mode from road to rail and other more sustainable modes; and an improvement to servicing and delivery vehicles, equipment and technology.

9.2.4 The Framework Travel Plan (FTP)

An important means for ensuring that the aspirations of the Integrated Transport Strategy are realised will be through the implementation of The Framework Travel Plan. This is submitted in conjunction with the Transport Assessment as part of the planning application. The Transport Assessment provides details relating to the effects of major development at BXC on the surrounding highway and public transport networks.

The Transport Assessment has discussed a number of issues which have been assessed in relation to the development. These include a number of inputs to the modelling and assessment process, as well as the transport improvements to the surrounding transport networks, as follows:

- the levels of trip generation by highway, public transport and soft modes;
- assumed trip distribution;
- car parking availability;
- new public transport infrastructure and services;
- access and junction improvements, and
- how the transport proposals can contribute to the surrounding transport networks.

The BXC transport proposals fall into two principal categories:

- The physical works to be done to facilitate the development and mitigate impact, and
- The measures to be undertaken to encourage modal shift.

Physical infrastructure is only part of the picture, as there are significant sets of behavioural issues that are challenges in a transport sense as well. These need to be addressed. People need to be encouraged to use the public transport that will have been provided and in this way move the development towards the target modal split to public transport of 49% as indicated in the Development Framework. Whilst the number of car park spaces provided per dwelling can be progressively reduced (see Section 15.8.7) and the quality, quantity and the accessibility of public transport increased, it is recognised that even with all these measures it is likely to be necessary to try and manage people towards a greater use of public transport. This will not be a one-off issue but rather will be an issue that will require periodic monitoring to be effective.

The FTP sets out the mechanisms for maximising the potential for sustainable travel by users and occupiers of the site, in relation to the transport issues set out in the TA. The FTP provides a framework within which travel behaviour of users of the development can be managed, with an action plan for the delivery of sustainability.

Specifically, the FTP addresses:

- target mode share, both final and interim;
- roles and responsibilities;
- baseline conditions;
- aims and objectives;
- other targets;
- travel demand management;
- management of the FTP process, and
- proposed approach to phased construction.

The FTP provides guidance for occupiers in the production of their own travel plans, specifically addressing commercial occupiers, Brent Cross Shopping Centre (BXSC), residential areas and schools. This guidance also includes a non-exhaustive list of possible initiatives which could be implemented to assist in achieving defined targets.

9.2.5 Transport Infrastructure

Transport infrastructure will be provided that is adequate to cater for the future travel demands in the area. The new and improved transport infrastructure will not only provide for the residents and users of the development but will also significantly improve local and strategic accessibility for residents of adjoining communities, providing this area of North West London with high quality public transport facilities.

Overall, the development has been shaped by the proposed public transport network which will transform the BXC into a highly accessible town centre, second to none outside Central London.

The transport infrastructure proposals for the development site will cater for two separate but complementary levels of access:

a) Strategic – to provide for the forecast high number of trips to and from areas outside of the immediate locality, and

b) Local – providing connections and good permeability with the surrounding areas.

Strategic access

Key to the success of the proposals will be the New Cricklewood Station on the Midland Main Line railway corridor. Some 16 trains per hour in both directions could serve this new station. The existing Cricklewood Station will remain open although the frequency of train services stopping at this station will be reduced.

Infrastructure will be provided to enable the New Cricklewood Station to be directly connected to bus-based services that will pass through the BXC site and link with BXSC, the existing Cricklewood Station to the south and Brent Cross Underground station on the LUL Northern line to the east.

To facilitate strategic road access there will be major at-grade improvements to both the M1/A406 and the A406/A5 junctions. These will include full traffic signal control. In addition the A406/A41 Mid Level Junction will be significantly improved, through signalisation and additional capacity being provided for turning and circulating traffic. A new access will be provided for the BXSC directly off the A41/A406 junction, together with a new secondary egress onto the A406 eastbound slip road. A new signal controlled road junction on the A41 will provide improved access to the Eastern Lands.

Local access

The mainstay of the local public transport provision will be a big improvement in the existing bus services centred on the Brent Cross Bus Station and Transport Interchange. The bus services will be extended, improved and supplemented to provide a comprehensive network of services throughout this sector of London and feeding through the BXC site. Additional services will be provided to the Queensbury, Kenton and Wembley areas.

The improved routeing of the bus services will be achieved by the provision of a combination of dedicated bus links, bus priority and new bridges over the A406 North Circular Road and the Midland Main Line. This will significantly improve journey times and reliability of service.

A comprehensive pedestrian and cycle network will be provided throughout the BXC site, linking into the surrounding community along wide, shared-use footways/cycleways adjacent to the local road system or on completely segregated paths as appropriate.

Provisions have been made that will help provide step-free access at Brent Cross Underground Station and the existing Cricklewood Station.

9.2.6 Overview – a sustainable solution

The BXC development proposals are substantial, but are located in an area that is potentially highly accessible by all modes of transport.

The proposals capitalise on this potential through a comprehensive integrated transport strategy which provides for major new transport infrastructure across all modes, and the substantial enhancement of levels of service on new and existing transport provisions, thereby creating a high level sustainability in transportation.

The transportation improvements will provide access to the core of BXC whilst improving its links with adjacent mature urban areas.

The BXC proposals include major transport infrastructure provision including a New Cricklewood Station on the Midland Main Line railway; comprehensive improvements to bus services; major improvements to the M1/A406 and A5/A406 junctions; improvements to the A406/A41, A5/A407 and A5/Claremont Road junctions; a new junction on the A41; access improvements at BXSC; new traffic signal controlled junctions with road widening along the A5 Edgware Road, and a number of other new roads and junctions to provide access within the development site.

In terms of public transport provision the New Cricklewood Station will be key to facilitating strategic access to the core of the BXC site, especially in the peak periods. Significant improvements are also provided at the Brent Cross Bus Station, Brent Cross Underground Station and existing Cricklewood Station. Bus services will be significantly improved throughout the area. The bus services will also have a strategic role but will primarily provide a comprehensive local public transport facility. This local provision will be further enhanced by the provision and enhancement of comprehensive pedestrian and cycle facilities.

The promotion of the public transport facilities will be complemented by a policy of constraining car parking provision and traffic management within the site designed to specifically address the non-car travel modes. The car parking provision within the BXC site will be well within the maximum standards advocated in the LB Barnet and London Plan standards. The public parking provision will be managed in such a way as to mitigate against the use for long stay employment purposes.

The level of sustainability associated with these improvements is further reinforced by a comprehensive system of travel planning and demand management which provides for travel plans for all land uses, a servicing and delivery strategy, and a car parking strategy.

The highway improvements associated with the scheme are substantial but limited to those necessary to provide an appropriate interface between the BXC site and the adjacent strategic and local highway networks.

The proposals will however inevitably lead to an increase in vehicular traffic flows but the Transport Assessment shows that these can be accommodated by the improved highway network. This network will also provide significant benefits to other road users in the local area. However some pressure points will remain which are inevitable in a congested network.

As with any increase in trips resulting from a specific development, the level of demand and vehicle routeing through a particular area will be mitigated with existing journeys being undertaken on different routes, at different times or indeed by different travel modes (i.e. public transport).

The proposed transport provision and infrastructure have been specifically designed to be sustainable in terms of national, regional and local transport policy having regard to the overall size of the development, together with the commercial and socio-economic considerations that will enable such a high standard development to be implemented in the Cricklewood, Brent Cross and West Hendon Regeneration Area of North West London.

Based on these conclusions it is considered that the transportation outcome that will prevail as a result of the BXC development proposals will represent a significant improvement to the efficiency and sustainability of transportation in the area. The transport impact of the BXC proposals is therefore considered to be both desirable and acceptable.

9.3 Sustainable Urban Drainage Strategy

9.3.1 Introduction

The Development Partners are committed to reduce the water run off rates at BXC and to minimise the risk of flooding by using a number of attenuation measures to achieve a Sustainable Urban Drainage Strategy.

9.3.2 Policy and Guidance

The following polices, regulations and guidance have been considered when developing the sustainable drainage strategy

- Planning Policy Guidance Note 25 (PPG25), Development and Flood Risk (ODPM, 2001);
- Draft of Planning Policy Statement 25 (PPS25), Development and Flood Risk (DCLG, 2006);
- The London Plan: Consolidated with Alterations since 2004 (GLA, February 2008);
- London Plan Supplementary Planning Guidance on "Sustainable Design and Construction" (May 2006);
- London Borough of Barnet's Unitary Development Plan (adopted May 2006);
- Supplementary Planning Guidance "Cricklewood, Brent Cross and West Hendon Regeneration Area Development Framework" (December 2005);
- Draft Supplementary Planning Document (SPD) Sustainable Design and Construction (LBB, November, 2006);
- Building Regulations 2000; Approved Document H;
- BS EN 752 "Drain and Sewer Systems Outside Buildings;
- SUDS Design Manual for England and Wales, CIRIA Report 522;
- SUDS Best Practice Manual, CIRIA Report 523;
- SUDS Hydraulic, Structural and Water Quality Advice, CIRIA Report 609;
- Draft of "Sustainable Drainage Systems: A practical Guide" produced by the Thames Region of the Environmental Agency (October 2006), and
- Sewers for Adoption 6th Edition (SFA 6th). A Design and Construction Guide for Developers. WRc plc. (March 2006).

9.3.3 Sustainable Urban Drainage at BXC

It is intended to reduce the run-off rate by accommodating and managing the flow through the use of SUDS to control the quantity and quality of the discharged water. All the SUDS techniques recommended by the Environment Agency have been considered in turn for both the economic and environmental benefits they will contribute to the development.

Due to the site parameters, topography, location and the availability of systems the opportunities to reduce the surface water run-off at the Brent Cross Cricklewood site are limited. Nevertheless, through the careful selection and location of SUDS features, it is believed that the discharge can be reduced to approximately 75% of the current 1-in-100 year return period flow.

Guidance on Sustainable Drainage Systems is provided in the Draft of "Sustainable Drainage Systems: A practical Guide" produced by the Thames Region of the Environmental Agency (October 2006). This document provides the following hierarchy of measures that should be considered to achieve more sustainable systems.

Table 1 – The SUDS hierarchy. (From Draft of "Sustainable Drainage Systems: A practical Guide" produced by the Thames Region of the Environmental Agency, October 2006).

SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife benefit
Living roofs	Y	Y	Y
Basins and ponds • Constructed wetlands • Balancing ponds • Detention basins • Retention ponds	Y	Y	Y
Filter strips and swales	Y	Y	Y
Infiltration devices • Soakaways • Infiltration trenches and basins	Y	Y	Y
Permeable surfaces and filter drains • Gravelled areas • Solid paving blocks • Porous paviors	Y	Y	
Tanked systems • Over-sized pipes / tanks • Storm cells	Y		

The application of various SUDS techniques at Brent Cross Cricklewood are addressed in the following paragraphs and further detail is provided in the Drainage Strategy (BXC 15).

Soakaways, retention ponds and infiltration trenches

The current Site Investigation Desk Study states that the ground conditions at the site are not conducive to infiltration devices such as soakaways, retention ponds or infiltration trenches. This is due to the low infiltration rate which will result in trenches and ponds performing poorly. As the site is currently developed this is the likelihood of contaminant migration whereby particles can be transported into groundwater systems through infiltration. Therefore these features are not included in the proposals.

Living / Green roofs

Source control features such as living/green roofs and brown roofs are considered in the strategy. Alternatively, roofs can be used as an additional living space with paved areas that may include a permeable surface and can be incorporated as part of a water-harvesting regime. It is anticipated that up to 10% of the development's available roof area could be used.

Detention basins

Also proposed are detention basins. These site control features fill in times of heavy rainfall and assist in regulating water from a large area. Water is then released back into adjacent watercourses or surface water drainage at managed rates. These basins require large areas of land and therefore can only be located where there is sufficient space. However, these areas can be landscaped to provide a green domain for local residents.

Gravelled Areas

The illustrative masterplan for the development does not show open gravelled areas. However, gravel or granular material is proposed for use with lining below paved areas as part of other SUDS features as discussed later in this report. These features slow the release of surface water into the ground as an infiltration feature, but in this case either into watercourses and pipes. Microbes can be found within the pores of such areas which assist in the breakdown of hydrocarbons.

Swales

Although an infiltration feature, swales are included in this study. Swales are ditches with broad bases and gently sloping sides where surface water is able to spread over a vegetated area and percolate through the soil. However, due to the poor infiltration at the site, it is proposed that these features are only sited where adequate green space is available to allow for the maximum wetted perimeter for percolation aided by evapotranspiration, through vegetation, and evaporation to aid the low infiltration rate.

Permeable paving

Permeable paving, a filtration device, is proposed for the site and includes a granular sub-base which can purify surface water through microbial action. The depth of the granular sub-base can be increased to suit storage requirements and could be supplemented with thin cellular storage or drainage blankets which would be wrapped in an impermeable membrane. Permeable paving is an ideal solution for the provision of SUDS where large hard paved landscapes are proposed.

Pipe storage

Pipe storage utilises oversized pipes and orifice plates or hydro-brakes to store surface water and attenuate flows to acceptable discharge rates

Cellular pre-formed storage features can be placed off-line at the source of the additional surface water prior to it entering the main network. These cells can be placed under hard standing areas such as car parks and drives, or alternatively in courtyard. It is proposed that these features are installed with a gravel filtration layer, or beneath vegetation where appropriate, to remove contaminants from the water.

Details of the specific features to be employed will be defined at a detailed design stages and agreed with the Local Planning Authority.

9.3.4 Attenuation of surface water flows

The use of the most suitable SUDS techniques will ensure that a sustainable approach can be maintained for purifying and attenuating surface water while also relieving pressure on the space occupied by the SUDS features.

The use of the various SUDS techniques will help achieve a 25% reduction in the current 1-in-100 year return period flow. The anticipated usage of each SUDS technique, as a percentage of the total attenuation proposed for the development, is shown in Table 9.1, below.

Table 9.1. The anticipated usage of each SUDS feature as a percentage of the total attenuation proposed at the development.

SUDS Technique	Contribution to SUDS at Brent Cross Cricklewood
Living roofs	5-15%
Basins and ponds	
• Constructed wetlands	0
• Balancing ponds	0
• Detention basins	5-15%
• Retention ponds	0
Filter strips and swales	5-15%
Infiltration devices	
• Soakaways	N/A
• Infiltration trenches and basins	N/A
Permeable surfaces and filter drains	
• Gravelled areas	0
• Solid paving blocks	0
• Porous paviors	10-20%
Tanked systems	
• Over-sized pipes / tanks	0-10%
• Storm cells	60-70%

10 Implementing the Strategy

This section of the strategy explains the mechanisms that have been established to ensure the successful implementation of the BXC Environmental Sustainability Strategy throughout the processes of design, construction and operation. The BXC Development Partners are fully committed to this Environmental Sustainability Strategy and would be responsible for driving its implementation down through the supply chain from the outset.

10.1 Code for Construction Practice

Relevant environmental requirements for the construction phase are defined in a Code of Construction Practice, which is attached to the Development Specification & Framework. The Code of Construction Practice for the development sets the environmental framework for each construction contract, and will incorporate relevant planning conditions and other environmental requirements and constraints that may be imposed or otherwise adopted through the planning process. It includes a set of parameters for the preparation of Construction Environmental Management Plans which would be a requirement of construction contracts.

10.2 Development Specification & Reserved Matter Applications

The proposals for the regeneration of BXC that will form the planning application establish a framework within which the redevelopment will be delivered. The applicants will provide the Council with details of proposals for individual parts of the site through future detailed submissions.

The core commitments that result from this Environmental Sustainability Strategy have been interpreted into the Development Specification and Framework (BXC 1) which supports the application submission. It is envisaged that the Council will impose planning conditions upon the grant of any planning permission, where appropriate, requiring conformity with the Development Specification and Framework (BXC 1), unless otherwise agreed in writing by the LPA. In view of this it is anticipated that a supplementary statement will be submitted with all relevant reserved matter applications to demonstrate to the Council how those environmental elements of the Environmental Sustainability Strategy defined in the Development Specification and Framework have been the incorporated, where appropriate. The Council therefore has assurances that the requirements of this strategy will be delivered. This process is described in Section 6 of the Development Specification & Framework.

The Environmental Sustainability Strategy refers to other technical documents which support the application submission including the Public Realm & Open Space Strategy, Transport Assessment and Framework Travel Plan. The components parts of these strategies have also been incorporated in the Development Specification, and Framework where appropriate, or as planning conditions.

Environmental Sustainability Strategy

Bill Addis
Buro Happold Limited
17 Newman Street
London
W1T 1PD
Telephone: +44 (0)20 7927 9700
Facsimile: +44 (0)870 787 4145

Email: bill.addis@burohappold.com