NORTH WEST cambridge

Sustainable Resource and Waste Management Strategy

September 2011

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Introduction

1 Introduction

1.1 Scope

The aim of this study is to provide the basis for a sustainable resource management strategy for the proposed North West Cambridge development ("Proposed Development") ("Application Site") and to develop proposals for waste management during the construction and occupation phases of the development.

1.2 Project Background

The Proposed Development aims to create a new community for living and working on the north western fringe of the city. The University site is located between Madingley Road and Huntingdon Road and will include:

Zone B:

- Up to 3,000 dwellings; (Class C3 and C4)
- Up to 2,000 student bedspaces; 98,000 sq.m. (Class C2)
- Up to 100,000 sq.m. new employment floorspace, of which:
    - Up to 40,000 sq.m. commercial employment floorspace (Class B1(b) and sui generis research uses)
    - At least 60,000 sq.m. academic employment floorspace (Class D1)
- Up to 5,300 sq.m. gross retail floorspace (Use Class A1/A2/A3/A4/A5) (of which the supermarket is not more than 2,000 sq.m. net floorspace)
- Senior living; up to 6,500sq.m. (Class C2)
- Community centre; up to 500 sq.m. (Class D1)
- Indoor sports provision, up to 450 sq.m. (Class D1)
- Police; up to 200 sq.m. (Class B1)
- Primary Health Care; up to 700 sq.m. (Class D1)
- School; up to 3,750 sq.m. (Class D1)
- Nurseries; up to 2,000 sq.m. (Class D1)
- Community Residential; up to 500 sq.m. (Class C3)
- Hotel (130 rooms); up to 7,000 sq.m. (Class C1)
- Access roads
- Pedestrian, cycle and vehicle routes
- Parking
- Energy Centre; up to 1,000 sq.m.
- Provision and/or upgrade of services and related service media and apparatus including pumping stations, substations and pressure regulators
- Drainage works (including sustainable ground and surface water attenuation and control)
- Open space and landscaping (including parks, play areas, playing fields, allotments, water features, formal/informal open space, maintenance sheds, pavilions and support facilities)
- Earthworks to provide revised ground contours

- Demolition of existing buildings

Zone A: Huntingdon Road - Highway and Utility Works

- Construction of a new three arm and a new four arm signal controlled junctions, including pedestrian and cycle crossings, to provide access to the Proposed Development from Huntingdon Road
- Installation of a toucan crossing across Huntingdon Road
- Construction of an unsegregated footway/cycleway on the southern side of Huntingdon Road
- Diversion and/or replacement and/or protection of existing utilities affected by the proposed highway works
- Provision of new telecommunications infrastructure and connection to existing utility infrastructure situated along Huntingdon Road
- Related landscaping, accommodation works, street furniture, drainage, telemetry and utilities

Zone C: Madingley Road - Highway and Utility Works

- Junction improvement works at the High Cross/Madingley Road junction to alter it from a three arm priority junction to a four arm signal controlled junction, including pedestrian and cycle crossings, to provide access to the Proposed Development
- Installation of a toucan crossing across Madingley Road
- Diversion and/or replacement and/or protection of existing utilities affected by the proposed highway works
- Installation of a retaining wall along Madingley Road
- Provision of a new pumped foul water rising main, including chamber connection, and new telecommunications, electricity and gas infrastructure and the associated connection to existing utility infrastructure situated along Madingley Road
- Related landscaping, accommodation works, street furniture, drainage, telemetry and utilities

The Area Action Plan (AAP) for the Application Site was adopted by Cambridge City Council and South Cambridgeshire District Council in October 2009 to guide development. It contains a number of policies aimed at developing a sustainable site including a requirement for all homes (apart from the first 50 if built before 2013) to meet level 5 of the Code for Sustainable Homes (Code), and for all non-residential development to meet Building Research Establishment Environmental Assessment Method (BREEAM) “Excellent” standards.

Policy Review

2 Policy Review

2.1 Waste Strategy for England 2007

National policy on waste management is presented in Defra's Waste Strategy for England 2007. The following bullet points highlight the key elements of the strategy;

- Decouple waste growth (in all sectors) from economic growth and put more emphasis on waste prevention and re-use.
- Meet and exceed the Landfill Directive diversion targets for biodegradable municipal waste in 2010, 2013 and 2020.
- Increase diversion from landfill of non-municipal waste and secure better integration of treatment for municipal and non-municipal waste.
- Secure the investment in infrastructure needed to divert waste from landfill and for the management of hazardous waste.
- Get the most environmental benefit from that investment, through increased recycling of resources and recovery of energy from residual waste using a mix of technologies.

The main elements of the strategy are to:

- Incentivise efforts to reduce, re-use, recycle waste and recover energy from waste;
- Reform regulation to drive the reduction of waste and diversion from landfill while reducing costs to compliant businesses and the regulator;
- Target action on materials, products and sectors with the greatest scope for improving environmental and economic outcomes;
- Stimulate investment in collection, recycling and recovery infrastructure, and markets for recovered materials that will maximise the value of materials and energy recovered; and
- Improve national, regional and local governance, with a clearer performance and institutional framework to deliver better coordinated action and services on the ground.

2.2 Planning Policy Statement 1: Planning for Sustainable Development

PPS1 sets out the Government's ethos for using the planning system as a tool for local authorities to promote continued development in a sustainable manner. PPS1 states: *'Development plan policies should take account of environmental issues such as… the management of waste in ways that protect the environment and human health, including producing less waste and using it as a resource wherever possible.'*

A supplement document to PPS1 - Planning and Climate Change sets out how planning should contribute to reducing emissions and stabilising climate change, taking into account unavoidable consequences. The key principles related to the development are outlined below:

- The proposed provision for new development, its spatial distribution, location and design should be planned to limit carbon dioxide emissions;
- New development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy; and
- New development should be planned to minimise future vulnerability in a changing climate.

2.3 Planning Policy Statement 10: Sustainable Waste Management

PPS10 is concerned with delivering the national waste targets set at EU level; it aims to*: '…protect human health and the environment by producing less waste and by using it as a resource wherever possible. Through more sustainable waste management, moving the management of waste up the 'waste hierarchy' of reduction, reuse, recycling and composting, using*

waste as a source of energy, and only disposing as a last resort the Government aims to break the link between economic growth and the environmental impact of waste…'

The waste hierarchy is an important consideration with regard to the Proposed Development. During excavation, demolition, construction, and occupation every effort should be made to adhere to its principles, with disposal to landfill only being undertaken as a last resort.

PPS10 also indicates that when determining planning applications, local authorities should consider the impact the development could have on the existing local waste infrastructure. Additionally, the statement outlines the advantages of producing a Site Waste Management Plan which does *'…not require formal approval by planning authorities, but are encouraged to identify the volume and type of material to be demolished and/or excavated, opportunities for the reuse and recovery of materials and to demonstrate how off-site disposal of waste will be minimised and managed.'*

2.4 Draft National Planning Policy Framework

The Draft National Planning Policy Framework ("the Draft NPPF")

The Government has published the draft National Planning Policy Framework ("the Draft NPPF") for consultation. The NPPF will replace the current suite of national Planning Policy Statements, Planning Policy Guidance notes and some Circulars with a single, streamlined document.

The NPPF will set out the Government's economic, environmental and social planning policies for England. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations. The draft NPPF continues to recognise that planning system is plan-led and that therefore Local Plans, incorporating neighbourhood plans where relevant, are the starting point for the determination of any planning application. In assessing and determining development proposals, local planning authorities should apply the presumption in favour of sustainable development and seek to find solutions to overcome any substantial planning objections where practical and consistent with the NPPF.

The Draft NPPF does not contain specific waste policies, since national waste planning policy will be published alongside the National Waste Management Plan for England. However, local authorities preparing waste plans are to have regard to policies in this Framework

2.5 East of England Plan (2008)

The adopted East of England Plan 2008 is the Regional Strategy for the East of England region ("the RSS") of which Cambridge forms part. The recently published Localism Bill provides for the abolition of Regional Strategies and is expected to be enacted in November 2011; although the abolition of individual Regional Strategies is not expected to take effect until the consequence of abolition has been the subject of Strategic Environmental Assessment. Until the East of England Plan is formally abolished it remains, therefore, part of the statutory Development Plan. The current state of play is that decisions must be in accordance with the statutory Development Plan unless material considerations require otherwise. In the meantime, LPAs are entitled to take account of the Government's intention to abolish Regional Strategies as a material consideration but the weight to be given will for the time being be limited. For this reason the relevant policies of the East of England Plan are rehearsed below.

On abolition of the East of England Plan, Local Plans incorporating neighbourhood plans where relevant, will be the statutory Development Plan for the determination of any planning application. The presumption in favour of sustainable development within the NPPF will require that development proposals that accord with statutory plans should be granted planning consent without delay; and where the plan is absent, silent, indeterminate or where relevant policies are out of date planning permission should still be granted unless the adverse impacts of allowing development would significantly and demonstrably outweigh the benefits, when assessed against the policies in this NPPF taken as a whole. As explained below the local statutory development plan covering the area of the Application Site comprises the North West Cambridge Area Action Plan (AAP), South Cambridgeshire District Council Core Strategy and related local development documents and Cambridge City Local Plan. The

Area Action Plan is up to date and is the central policy document in relation to this Proposed Development forming part of the Councils' Local Development Framework

The RSS responds to a number of regional policy drivers, but one that is specifically relevant to waste management is:

- Putting in place a framework that promotes sustainable development, especially to address housing shortages, support the continued growth of the economy and enable all areas to share in prosperity, whilst driving energy efficiency and carbon performance, improving water efficiency and recycling an increasing percentage of waste.

Section 11 of the EEP outlines the waste management strategy for the region. Policy WM1 outlines the objectives of the RSS waste management policies as:

- To minimise the impact of new development, particularly in the key centres of development and change, on regional waste management requirements;
- To minimise the environmental impact of waste management, including impacts arising from the movement of waste, and help secure the recovery and disposal of waste without endangering human health; and
- To seek community support and participation in promoting responsible waste behaviour and approaches to management, viewing waste as a resource and maximising re-use, composting and energy recovery.

Policy WM6 outlines policy related to waste management in development:

- Development should be designed and constructed to minimise the creation of waste, make maximum use of recycled materials and facilitate the collection, separation, sorting, recycling and recovery of waste arising from the development and surrounding areas, where appropriate. Within major developments provision should be made for waste management facilities to enable the sustainable management of waste through innovative approaches to local waste reduction, recycling and management.

Policy WM8 outlines requirements for waste authorities, waste companies and other partners, including inter alia:

- Waste collection systems which aim to minimise waste at source should be adopted throughout the region, and separate collections of recyclable and compostable materials introduced;
- All collection and recycling / composting schemes should be supported by a strong waste minimisation message.

Section 11 of the EEP places further requirements on waste disposal and collection authorities:

- To maximise recycling and composting, waste disposal authorities and waste management companies should encourage composting or biodigestion of biodegradable wastes. In addition to providing for the collection of separated biodegradable waste and green waste composting, initiatives such as home composting and the use of re-usable nappies should be supported; and
- The production and collection of separated waste from industrial and commercial producers should be encouraged. Waste management companies should promote the collection of separate waste from firms. Joint action by or on behalf of groups of waste producers (for example tenants of industrial estates) should be encouraged.

2.6 Cambridgeshire and Peterborough Waste Local Plan (2003)

The Waste Local Plan sets out the best locations for future waste management facilities and the planning policies that will apply to new planning applications for waste development. The Plan outlines, through policies, provision for the future. Following the adoption of the Cambridgeshire and Peterborough Core Strategy, the 2003 Waste Local Plan has largely been superseded and is not considered in further detail in this policy review.

2.7 Cambridgeshire & Peterborough Minerals & Waste Core Strategy Development Plan Document

Cambridgeshire County Council and Peterborough City Council have worked together to prepare a local development framework, document the *"Cambridgeshire & Peterborough Minerals & Waste Core Strategy Development Plan Document"* (the Core Strategy). The Core Strategy was adopted on 19 July 2011. The Core Strategy addresses the spatial planning of the authority areas in respect of the production and movement of minerals and management of waste.

Policy 'CS2 – Strategic Vision and Objectives for Sustainable Waste Development' includes a Strategic Objective that will ensure that *"all major new developments undertake sustainable waste management practices which will include the provision of temporary waste management facilities which will be in place throughout the construction of the development".* This objective is re-iterated in Policy 'CS28 – Waste Minimisation, Reuse and Resource Recovery'.

Developers may be required to support financially the expansion or construction of household recycling centres as outlined in CS16 below. The scale of these contributions will be set out in the RECAP Waste Guide. Furthermore, other policies relevant to the development are discussed below.

2.7.1 CS16 - Household Recycling Centres

A network of household waste recycling facilities easily accessible to local communities will be developed through the Site Specific Proposals Plan. New household recycling centres will be in the following broad locations:

- Cambridge East;
- Cambridge North;
- Cambridge South;
- Northstowe;
- Peterborough.

New housing development will contribute to the provision of household recycling centres. Contributions will be consistent with the RECAP Guide and additionally in Peterborough the Planning Obligations Implementation Scheme in Peterborough.

If a waste management facility were to be included within the development, then the design of this facility would be required to achieve integration with surrounding uses, have a minimal visual impact and maximise sustainability criteria as outlined in CS24, below.

2.7.2 CS18 – Waste Management Proposals Outside Allocated Areas

CS18 considers proposals for waste management development outside allocated areas where consistent with the emerging Core Strategy whilst contributing to sustainable waste management. Facilities for waste recovery and recycling may be permitted where they are (taken from Core Strategy):

- For on-site management of waste;
- On land identified for general industrial use;
- Co-located with complementary activities (including existing permanent waste management sites);
- On previously developed land;
- On farm holdings to facilitate agricultural waste recycling;
- Within a medical or research institution which is generating waste (bio-medical, research and clinical waste only);
- In strategic development areas;
- At inert landfill sites (inert recycling only).

All strategic development will make provision for permanent waste management.

2.7.3 CS22 – Climate Change

Waste management proposals should take account of climate change for the lifetime of the development, minimising greenhouse gas emissions whilst allowing flexibility for future adaptation.

This policy sets out that proposals should state how this will be achieved which may include the following:

- Quantifying the reduction in carbon dioxide and other relevant greenhouse gases e.g. methane, that will be achieved as part of the proposal, and how this will be monitored and addressed in the future;
- Demonstrating how the location, design and transportation related to the development will limit greenhouse gas emissions;
- Demonstrating carbon off-set measures which will put in place, and how these will be delivered / implemented;
- Setting out how the proposal will make use of renewable energy e.g. opportunities for energy from waste (waste proposals only); use of decentralised and renewable or low carbon energy;
- Incorporation of sustainable drainage schemes to minimise flood impacts;
- The creation of carbon sinks formed by habitat creation e.g. through restoration / landscaping schemes.

2.7.4 CS34 – Protecting Surrounding Uses

Waste management developments will only be permitted where it can be demonstrated that there would be no significant harm to the environment, human health or safety as well as on existing or proposed neighbouring uses, visual intrusion or loss to residential or other amenities.

Mitigation measures will be required, including where appropriate a buffer zone, between the proposed development and neighbouring existing or proposed sensitive land uses.

2.7.5 CS24 - Design of Sustainable Minerals and Waste Management Facilities

All proposals for minerals and waste management development will be required to achieve a high standard in their design and mitigation of environmental impacts including climate change.

Waste Management proposals must be consistent with the guidance provided in The Location and Design of Waste Management Facilities (Supplementary Planning Document).

2.7.6 CS26 – Mineral Safeguarding Areas

Mineral safeguarding areas identify potential resources of minerals which could be viably accessed in the future. This policy requires:

- Applications to consider the safeguarding maps and consult with the Mineral Planning Authority during the application process.
- The policy states that applications will only be approved where: the minerals no longer or potentially have any economic value; the minerals are extracted prior to development or can be extracted post development; there is an overriding need for development regardless of mineral extraction, or; there is no conflict between the development and future mineral extraction.

The policy states that consultation with the Mineral Planning Authority is not required in areas where there is a previously adopted local development plan, such as the AAP for North West Cambridge.

The minerals safeguarding policy and its relation to the site is discussed in further detail in the Environmental Statement [1].

2.7.7 CS28 – Waste Minimisation, Re-Use and Resource Recovery

The Waste Planning Authorities will encourage waste minimisation, re-use and resource recovery through requiring:

- A waste management audit and strategy to put in place practicable measures to maximise waste minimisation, sorting, re-use, recovery and recycling of waste on all developments over the value of £300,000 (achieved through the Site Waste Management Plan);

[1] The Mineral Areas Safeguarding report submitted as part of this planning application (Appendix 8.4 to the Environmental Statement) provides more information on areas within the site identified in the Minerals and Waste Core Strategy.

- Residential and commercial development proposals to submit a completed RECAP Waste Design Guide Toolkit Assessment and make provision for waste storage, collection, and recycling consistent with the RECAP Waste Design Guide;
- New housing development will contribute to the provision of bring sites. Contributions will be consistent with the RECAP Waste Design Guide and additionally in Peterborough the Planning Obligations Implementation Scheme;
- Temporary waste recycling facilities in strategic development areas including the Cambridge and Peterborough development areas, Northstowe, and St Neots. These should maximise the reuse, recycling and recovery of inert waste streams from construction and demolition operations, and be in place throughout the construction phases of these major development areas.

2.8 North West Cambridge Area Action Plan (2009)

The Area Action Plan for North West Cambridge identifies land to be released from the Cambridge green belt to contribute towards meeting the development needs of the University of Cambridge, provides an overall vision and objectives, and sets out policies to guide the development.

- Policy NW24: Climate Change and Sustainable Design and Construction requires that residential development: For up to a maximum of 50 dwellings across the site approved on or before 31 March 2013 Code for Sustainable Homes Level 4 or higher shall be achieved.
- For above 50 dwellings the Code for Sustainable Homes Level 5 or higher (these levels include water conservation measures) shall be met.

Non residential development and student housing will be required to:

- Achieve a high degree of sustainable design and construction in line with BREEAM “excellent” standards or equivalent if this is replaced.
- Reduce its predicted carbon emissions by at least 20% through the use of on-site renewable energy technologies only where a renewably fuelled decentralised system is shown not to be viable.

Policy NW 28: Construction process sets requirements for waste management and minimisation during the construction stages. It specifically requires:

- The recycling or re-use of construction waste.
- Minimising the transfer of spoil from the site, and aiming to accommodate spoil in the civils works and landscaping.
- Maximising the re-use and recycling of existing materials on the site.
- Avoiding disruption to neighbouring parts of the city through the minimisation of waste transportation and consideration of handling materials on site.

2.9 RECAP Partnership: Waste Management Design Guide

The *RECAP Partnership: Waste Management Design Guide (RECAP Guide)* was written on behalf of the Cambridgeshire District Councils, Cambridgeshire County Council and the Unitary Authority of Peterborough. At present this document has been endorsed by the RECAP partners; however it has not yet been adopted as a Supplementary Planning Document (SPD) in any of the Authorities. The RECAP guide is currently undergoing a public consultation with the intention that it will be adopted as an SPD by Cambridgeshire County Council and Peterborough City Council. A review of the guide has ensured consistency with the recently adopted Cambridgeshire and Peterborough Minerals and Waste Core Strategy.

The Guide has been created to:

- Detail the waste segregation, storage and collection requirements that designers and developers need to satisfy;
- Provide a strategic tool for the use by Planning Authorities when assessing planning applications;
- Address the unique waste management problems presented by high density developments;
- Expand upon the requirements set out in the Minerals and Waste Core Strategy for developer obligations relating to the funding and provision of waste management infrastructure [2];
- Highlight the financial implications of waste management upon developers;
- Highlight examples of good practice demonstrating what can be achieved;
- Contribute to sustainability and reduced environmental impact.

2.9.1 RECAP Waste Management Design Guide Toolkit

The RECAP Toolkit included in the RECAP guide allows a developer, in consultation with the relevant LA, to make an effective evaluation of the waste management requirements upon them and demonstrate compliance if necessary. All proposals must demonstrate use of the toolkit and submit it completed with their plans.

The Toolkit is made up of 3 components as outlined in Table 1.

Table 1: RECAP Waste Management Design Guide Toolkit

Toolkit Component	Description	Applicability and Use
Design Standards Checklist	Developers will be expected to demonstrate that their proposals satisfy the requirements of this Guide by assessing their proposals against the expected standards which are brought together under the Design Standards Checklist	Applies to all developments. To be used and completed by the developer and supported by plans and/or documents as appropriate.
Assessment Criteria	Depending upon development proposals, it may be that a developer is required to conduct a wider assessment of the impact of their scheme (or aspects thereof). Criteria for such an assessment are presented under the Assessment Criteria.	To be completed by the developer where proposals involve: the construction of waste storage compound(s): and/or installation of Bring Site infrastructure; and/or alternative schemes.
Basis for Conditions and Agreements	For some developments it may be appropriate to apply planning conditions or negotiate S106 agreements relating to several factors as detailed under the Basis for Conditions and Agreements.	To be utilised by the Local Planning Authority as appropriate in relation to: the provision of waste storage containers; the Recycling Centre network; and the Bring Site network.

Source: RECAP Partnership: Waste Management Design Guide, Recycle for Cambridgeshire and Peterborough, Draft SPD for consultation, February 2010.

- Design Standards Checklist – assessment of proposals against expected standards. This applies to all developments, and should be supported by plans/ documents as appropriate.
- Assessment Criteria – the developer may be required to conduct a wider assessment of the impact of their scheme. To be completed where proposals involve construction of a waste storage compound and/ or bring site infrastructure and/ or alternative schemes.
- Basis for Conditions and Agreements – some developments may require appropriate planning conditions or S106 agreements (a legally-binding agreement or planning obligation with a landowner in association with the granting of planning permission), to be utilised by the local planning authority in relation to provision of waste storage containers, recycling centre network and bring site network.

[2] See footnote 1.

2.10 The Location and Design of Major Waste Management Facilities SPD (2006) (also "The Location and Design of Waste Management Facilities" 2011).

This Supplementary Planning Document aims to *"provide a Good Practice benchmark to guide sustainable developments and designs to aid in evaluation and approval of proposals"* and to *"achieve the highest standards of design, in relation to integration, layout, access and environment, as well as making efficient use of materials."*

The SPD addresses major facilities, i.e. those that will recover, recycle, treat or transfer the types and volumes of waste that would normally go to landfill, including Material Recovery Facilities, Mixed Waste Processing Facilities, Windrow Composting, In Vessel Composting, Anaerobic Digestion, Energy from Waste facilities and Household Waste Recycling Centres.

It outlines aspects to consider which include:

- Siting – location next to transport network, capacity for high transport flows, minimization of impact on environment/surrounding uses, preference for industrial sites. Local Plan to be considered, e.g. not sterilising mineral reserves, control of noise and litter pollution, avoid affecting habitats and species. Also refer to Policy WLP18 of the Waste Local Plan;
- Rural Locations – acceptable if located next to transport networks, should reflect the scale and design of agricultural buildings, local distinctiveness, re-use of existing buildings, paved access roads;
- Urban Locations – particularly appropriate for operating which take place inside buildings. Can be located in established commercial/ industrial or new development areas, within commercial/ industrial areas should have high quality urban design. Should provide for sustainable transport for employees e.g. bus/cycle routes. Can act as 'buffer' zones between sensitive land uses and other forms of development;
- Co-Location of Facilities – offers benefits in reducing need for transport of waste and treated product, whilst allowing synergies of different collection and treatment methods and maximising resource recovery. Makes efficient use of land and benefits sustainable transport;
- Co-location with Household Waste Recycling Centres (HWRCs) – this provides transport benefits and possibility of linking existing facilities to use of bi-products of waste treatment process, assisting sustainability of the processes. Combined 'buffer' zones help make efficient use of land. Good transport links should be provided to allow members of public to visit the facilities safely and easily;
- Temporary Facilities – new construction sites should provide temporary waste management facilities to deal with construction waste, to include the re-use and recycling of materials on site thus minimising the need for transport from site and therefore the impact on the surrounding road network;
- Built Form – consideration should be given to the scale of the setting and the massing of the built form. The size of the building footprint and associated built works should be minimised to avoid impacts on biodiversity, such as use of green or brown roofs. Colour treatments on external materials may be appropriate. External storage of materials should be minimised;
- Local Distinctiveness – the facilities should address local distinctiveness through building form, colour treatment or type of materials used;
- Transport, Access, Circulation and Parking – site should be accessible by sustainable forms of transport with access, circulation and parking being integral to the design. This will include access for disabled employees/visitors as well as to the general public. Additionally the operational areas should be located in order to minimise their noise and visual impact;
- Lighting – lighting scheme should be within acceptable limits (e.g. Institution of Lighting Engineers), however opportunity for imaginative use of lighting whilst minimising light pollution and efficient use of energy. Potential to use solar power;
- Landscape and Boundary Treatments – sufficient space for landscape treatment and planting between roads and buildings, highlights use of native species and enhancement of biodiversity;

- Noise – good insulation, production of noise report to demonstrate agreed noise limits, monitoring and potential use of landscape 'buffers';
- Air Quality – measures to control air quality, dust and odour, potential to use energy efficient fuels;
- Water - water quality is a priority. Water collection could provide re-use opportunities and minimising water use;
- Pest Control;
- Energy efficiency and sustainable construction – including maximisation of use of daylight, heat recovery to reduce energy consumption such as use of green electricity and heating e.g. solar panels. Construction materials could use re-used/ recycled elements.

A 'Facility Guidelines' section outlines further details on how the guidance can be related to individual facilities.

This document has recently been updated as a Supplementary Planning Document linked to the Core Strategy Development Plan Document and was adopted in June 2011. It now goes wider than just major facilities and is called "The Location and Design of Waste Management Facilities".

2.11 Building Regulations 2000 (SI 2001/3335)

Building Regulations which are made under powers provided in the Building Act 1984 and apply in England and Wales are mainly found in The Building Regulations 2000 (as amended) and The Building (Approved Inspectors) Regulations 2000 (as amended). The Regulations apply to most new buildings and many alterations of existing buildings in England and Wales, whether domestic, commercial or industrial to ensure the health, safety, welfare and convenience of people in and around buildings, and the water and energy efficiency of buildings.

Guidance on how to meet the functional requirements of the Building Regulations is contained in 'Building Regulations – Approved Documents'. The requirements relevant to waste are provided in 'Approved Document H – Drainage and Waste Disposal'. Requirements specific to solid waste storage are outlined in Section H6 of the document and are summarised below.

The Waste Collection Authority (WCA) has powers to specify the type and number of receptacles to be used and the location where the waste should be placed for collection.

The requirements of the Building Regulations do not cover the recycling of household and other waste, but H6 does set out general requirements for solid waste storage; guidance is included regarding arrangements for separate storage of waste for recycling should it be necessary.

<u>Domestic developments</u>

- Domestic developments should provide a combined capacity of 0.25m^3 per dwelling or such other capacity as agreed with the WCA – where collections are less frequent than once per week this allowance should be increased accordingly.

Low rise developments (houses/bungalows/flats up to 4th floor)

- In low rise developments any dwellings should have or have access to a location where at least 2 moveable individual or communal waste containers, meeting the requirements of the WCA, can be stored
- Where separate storage areas are provided for each dwelling an area of 1.2m x 1.2m should be sufficient to provide for storage of waste containers and provide space for access. However, for communal storage areas, space requirements should be determined in consultation with the WCA.

High rise developments

- In multi-storey domestic developments dwellings up to the 4th floor may have their own waste container or may share a waste container.

- Dwellings above the 4th floor may share a single waste container for non-recyclable waste fed by chute, with separate storage for any waste which can be recycled. Alternatively storage compounds or rooms should be provided, in such a case satisfactory management arrangements for conveying refuse to the storage area should be assured.
- The use of 'Residents Only' recycling centres in large blocks has been found to be effective in some areas.

Siting

- Storage areas for waste containers and chutes to be sited so that resident transit of waste does not usually exceed 30m (excluding vertical distance) – containers should be within 25m of the collection point by the WCA.
- Location for storage of waste containers should be sited so that they can be taken to a collection point without being taken through a building (unless it is a porch, garage, car port or other open covered space).
- Waste containers up to 250 litres – steps should be avoided (if unavoidable the number of steps should never exceed 3) between the container store and collection point. Slopes not to exceed 1:12.
- Collection point should be reasonably accessible to the size of waste collection vehicles typically used by the WCA.
- External storage areas for containers should be away from windows and ventilators, preferably in shade and under shelter avoiding interference with pedestrian or vehicle access to buildings.

Design

- Enclosures, compounds or storage rooms should be a minimum of 2m high and provide for filling and emptying – 150mm between and around containers. Enclosures for individual containers should allow for lid to be opened for filling, whilst the enclosure should be permanently ventilated at top and bottom and should have a paved impervious floor.
- Communal storage to have provision for washing down and drainage of floor to polluted effluent system. Gullies to incorporate trap which maintains seal even during prolonged periods of disuse.
- Any room for open storage of waste should be secure to prevent vermin access. Any compound for the storage of waste should prevent vermin access unless waste is stored in secure containers with close fitting lids.
- Where storage rooms are provided, separate rooms should be provided for recyclable and non-recyclable waste.
- If publicly accessible / in open area around building, an enclosure / shelter should be considered.

High rise domestic developments

- If chutes are provided they should be at least 450mm diameter with a smooth non-absorbent surface and close fitting access doors at each storey that has dwellings. Chute to be ventilated at top and bottom.

Non-domestic developments

- The WCA should be consulted for guidance on resolving volume / nature of waste, storage capacity, frequency of collection, segregation of waste, method of storage, location of storage, treatment and collection points, hygiene arrangements in waste storage and treatment areas; and fire hazard and protection measures.

As with domestic developments, the following apply:

- Waste storage areas to have impervious floor and provision for washing down and drainage of floor to polluted effluent system. Gullies to incorporate trap which maintains seal even during prolonged periods of disuse.
- Any room for open storage of waste should be secure to prevent vermin access. Any compound for the storage of waste should prevent vermin access unless waste is stored in secure container with close fitting lids.
- Waste storage areas to be marked and signs provided.

Existing Local Waste Management Infrastructure and Practices

3 Existing Local Waste Management Infrastructure and Practices

A review of the existing and proposed local waste management facilities was carried out, in order to identify the available local infrastructure and current waste management practices. Cambridgeshire County Council performs the function of Waste Disposal Authority (WDA), with Cambridge City Council and South Cambridgeshire District Council performing the function of Waste Collection Authority (WCA) in the development area. The WCA is responsible for organising the kerbside collection for household waste and some trade waste; the boundary of the two WCA's dissects the site.

A Private Finance Initiative (PFI) contract has been used in Cambridgeshire to fund new waste management facilities. The Cambridgeshire County Council Waste PFI contract for £730 million was signed with Donarbon Waste Management Ltd in March 2008 for 28 years. Donarbon have constructed new facilities and will manage all household waste in the County for the full 28 year period.

3.1.1 Waste Management Facilities

The development would most likely be served by local waste management facilities such as Donarbon Waterbeach Waste Management Park. The park is a 'major waste facility' as designated in the Core Strategy which means the park may see development of waste management infrastructure. The current facilities at the park includes:

- MBT Plant;
- Education Centre;
- Windrow Composting;
- In-Vessel Composting Plant;
- Anaerobic Digestion;
- Secondary Aggregate and Materials Recycling;
- Skip Hire Services;
- Landfill;
- Asbestos Drop Off.

3.1.2 Recycling Centres

Cambridgeshire County Council provides 9 recycling centres offering members of the public (no business waste is accepted) the opportunity to dispose of household waste free of charge. These are run by private companies under contract with the council, a summary is provided in Table 2 below.

A new indoor recycling centre has been built in St Neots, providing extended opening hours, split level access and landscaping to provide screening and increase biodiversity. A planning application has been approved for the construction of a new indoor recycling centre to serve East Cambridgeshire in Witchford. The new site will open in late 2011 and will also provide split level access, extended opening hours, as well as being more energy efficient; this site will also use renewable energy, be constructed from sustainable materials and be landscaped to provide screening and increase biodiversity.

Table 2: Recycling Centres in Cambridgeshire

Recycling Centre	Site Address	Contractor	Waste Type Accepted	
			Standard items	Hazardous items
Alconbury	Woodwalton Road Alconbury Hill Cambridgeshire PE28 4JH	Donarbon	- Bicycle tyres - Bulky items - Cardboard - Clothes - Compost - Cooking oil - Foil - Garden waste - Glass jars and bottles - Hardcore* (concrete/rubble) - Light bulbs (inc energy saving bulbs) - Metal (tins/cans/scrap metal) - Mobile phones - Pallets (non-returnable only) - Paper - Plasterboard** - Plastic bottles*** - Timber - Shoes - Soil*	- Aerosols - Batteries (car/household) - Chemicals - Computer Monitors - Electrical items (even if not working) - Engine oil and filters - Fluorescent tubes - Fridges/freezers - Paint Televisions
Bluntisham	Heath Road Bluntisham Cambridgeshire PE28 3LQ			
Grunty Fen	Pools Road Witchford Ely Cambridgeshire CB6 2JE			
March	Hundred Road March Cambridgeshire PE15 8QN			
Milton	Butt Lane Milton Cambridgeshire CB24 6DQ			
St Neots	Marston Road St Neots Cambridgeshire PE19 2HB			
Thriplow	Gravel Pit Hill Thriplow Cambridgeshire SG8 7HZ			
Whittlesey	New Road Whittlesey Cambridgeshire PE17 1SZ			
Wisbech	Boleness Road Wisbech Cambridgeshire PE13 2RB			

* Subject to the CCC Construction and Demolition policy.

** Recycling centres can accept plasterboard in quantities that are in line with the CCC policy on Construction and Demolition waste. (Waste from large-scale construction, demolition, renovation and DIY projects is not accepted)

*** At Bluntisham, Grunty Fen, Milton, St Neots and Whittlesey only.

Source: http://my.cambridgeshire.gov.uk/mycambridgeshire.aspx?&tab=2&layers=hwrc

3.1.3 Bring Sites

3.1.3.1 Cambridge City Council

Cambridge City Council provides 25 Bring Sites (also known as Recycling Points) for the city of Cambridge which accept a limited range of recyclable material. The types of waste accepted are:

- Newspapers, magazines, white paper and white envelopes;
- Glass bottles and jars;
- Food and drink cans, aerosols and clean foil;
- Textiles;
- Books;
- Plastic bottles;
- Paper-based cartons (such as those made by Tetra Pak).

A list of the recycling points in Cambridge, alongside the types of waste accepted is provided in Table 3.

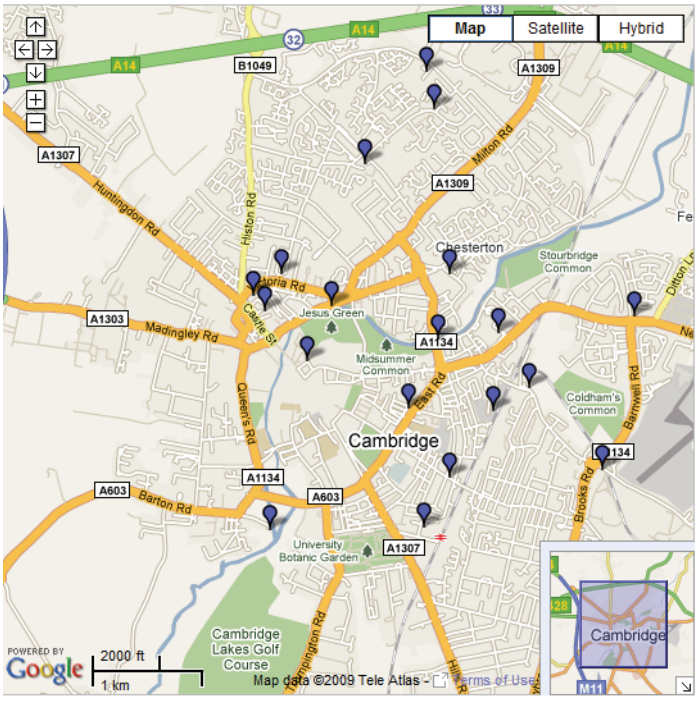
Table 3: Bring Sites in Cambridge

Area	Bring Sites	Types of Waste Accepted						
		Newspapers, magazines, white paper and white envelopes	Glass bottles and jars	Food and drink cans, aerosols and clean foil	Textiles	Books	Plastic bottles	Paper-based cartons (such as those made by Tetra Pak)
North Cambridge	Arbury Court car park	✓	✓	✓	✓		✓	
	Campkin Road shops car park	✓	✓	✓			✓	
	Chesterton Recreation Ground, Church Street	✓	✓	✓				
	Daily Bread car park, Kilmaine Close	✓	✓	✓				
	Chesterton Road	✓	✓	✓				
	Stretten Avenue	✓	✓	✓			✓	
East Cambridge	Abbey Road car park	✓	✓	✓				
	Beehive Centre, Coldhams Lane	✓	✓	✓	✓	✓	✓	✓
	Focus, Tenison Road		✓	✓			✓	✓
	Gwydir Street car park	✓	✓	✓			✓	
	McDonalds, Newmarket Road	✓	✓	✓			✓	
	Sainsbury's, Brooks Road	✓	✓	✓	✓	✓	✓	✓
	Tesco, Cheddars Lane (off Newmarket Road)	✓	✓	✓	✓		✓	✓

Area	Bring Sites	Types of Waste Accepted						
		Newspapers, magazines, white paper and white envelopes	Glass bottles and jars	Food and drink cans, aerosols and clean foil	Textiles	Books	Plastic bottles	Paper-based cartons (such as those made by Tetra Pak)
South Cambridge	Addenbrooke's Hospital, Robinson Way	✓	✓	✓			✓	
	Byron Square recreation ground	✓	✓	✓				
	Cherry Hinton Hall car park	✓	✓	✓			✓	✓
	Cherry Hinton High Street	✓	✓	✓				
	Colville Road car park	✓			✓			
	Waitrose, Hauxton Road	✓	✓	✓	✓	✓	✓	✓
	Wulfstan Way	✓	✓	✓			✓	
West Cambridge	Adam & Eve Street car park	✓	✓	✓				
	Castle Hill, Shire Hall car park	✓	✓	✓				
	Castle Hill car park	✓	✓	✓				
	Lammas Land recreation ground car park	✓	✓	✓	✓		✓	
	Park Street car park	✓	✓	✓				

A map indicating the location every Bring Site in Cambridge as listed above can be seen in Figure 1.

Figure 1: Bring Sites in Cambridge



Source: http://www.cambridge.gov.uk/ccm/content/environment-and-recycling/rubbish-waste-and-recycling/recycling/recycling-points-map.en

3.1.3.2 South Cambridgeshire District Council

South Cambridgeshire District Council (SCDC) provides 64 Bring Sites within the district which accept a limited range of recyclable material. The types of waste accepted include:

- Glass;
- Paper;
- Food and drink cans;
- Mixed textiles and clothes;
- Books;
- Cartons.

A list of the bring sites in Cambridge, alongside the types of waste accepted is provided in Table 4 below.

Table 4: Bring Sites in South Cambridgeshire

Village	Location	Types of Waste accepted					
		Glass	Paper	Food and drink cans	Mixed textiles and clothes	Books	Cartons
A603	Barton Road Layby	✓	✓	✓			
Gt Abington	Institute Car Park	✓	✓				
Arrington	Clifden Close		✓				
Barrington	Village Hall	✓	✓	✓	✓		
Balsham	Babraham Road	✓	✓				

Village	Location	Types of Waste accepted					
		Glass	Paper	Food and drink cans	Mixed textiles and clothes	Books	Cartons
Bar Hill	Tesco Car Park	✓	✓	✓	✓	✓	
Barton	Cambridge Road Layby	✓	✓	✓			
Bassingbourn	CP School, Brook Road	✓	✓	✓	✓		✓
Cambourne	Morrisons Car Park	✓	✓	✓	✓	✓	
Castle Camps	Village Hall	✓					
Conington	White Swan Public House	✓					
Coton	Primary School		✓				
Coton	Orchards Car Park	✓					
Comberton	3 Horseshoes Public House	✓					
Croydon	Queen Adelaide Public House	✓	✓				
Cottenham	Salvation Army Hall, High Street				✓		
Dry Drayton	Nr. School	✓					
Elsworth	Boxworth Road	✓	✓	✓			
Eltisley	Nr. Leeds Arms Public House	✓	✓		✓		
Gt Eversden	Village Hall		✓				
Lt Eversden	Recreation Ground	✓	✓	✓			
Fowlmere	Village Hall	✓	✓	✓			✓
Fulbourn	Tesco Car Park	✓	✓	✓	✓	✓	
Gamlingay	Community Centre, Stocks Lane		✓		✓		
Girton	Recreation Ground	✓	✓	✓			✓
Grantchester	Red Lion Public House	✓	✓				
Lt Gransden	Village Hall		✓				
Graveley	Cash & Carry Store	✓					
Hardwick	Recreation Ground	✓					
Harlton	Village Hall		✓				
Hauxton	Village Hall		✓				
Haslingfield	High Street lay-by	✓					
Heydon	Wood Green Animal Shelter	✓	✓	✓			
Hildersham	Village Hall		✓				
Hinxton	Red Lion Public House	✓					
Horseheath	Red Lion Public House	✓	✓				
Ickleton	Frogge Street	✓	✓				
Kingston	Village Hall		✓				
Linton	Health Centre Car	✓	✓	✓	✓		

Village	Location	Types of Waste accepted					
		Glass	Paper	Food and drink cans	Mixed textiles and clothes	Books	Cartons
	Park, Coles Road						
Longstanton	Social Club		✓				
Longstowe	Village Hall	✓	✓		✓		
Madingley	3 Horseshoes Public House	✓	✓				
Melbourn	Car Park, High Street		✓				
Meldreth	Fieldgate Nurseries, Station Road	✓	✓				
Milton	Tesco Car Park	✓	✓	✓	✓	✓	✓
Guilden Morden	Three Tuns Public House	✓	✓				
Steeple Morden	Recreation ground		✓				
Newton	Village Hall	✓	✓				
Orwell	Village Hall	✓	✓		✓		
Over	Community Centre	✓					
Papworth Everard	Pendrill Court				✓		
Sawston	Car Park, High Street	✓	✓	✓	✓		✓
Swavesey	St. Andrews Church Car Park, Station Road	✓	✓	✓	✓		
Gt Shelford	Memorial Hall		✓				
Lt Shelford	Beech Close		✓				
Stapleford	The Rose Public House	✓					
Teversham	Cherry Hinton Road	✓	✓				
Thriplow	Village Hall	✓	✓				
Toft	B1046 layby	✓	✓	✓	✓		
Waterbeach	Village Green	✓					
Waterbeach	Toddler Playgroup, Burgess Road		✓		✓		
Weston Colville	Car Park opposite Village Hall	✓	✓				
West Wickham	Village Hall, High Street	✓	✓				
Willingham	Co-op Car Park, High Street	✓	✓		✓		

3.2 Current Collection Schemes

3.2.1 Kerbside Collection

South Cambridgeshire District Council and Cambridge City Council arrange for waste collection from households in the Districts. The fortnightly collection in Cambridge City includes a black wheelie bin (or white sack) for residual waste, blue bin (or recycling

box) for mixed dry recyclables and a green bin (or brown sack) for food, garden and other organic waste. In addition, to assist in the collection of organic waste, Cambridge City Council provide free kitchen 'caddies' for residents.

Waste collections for household waste in the South Cambridgeshire include recyclable, organic and residual waste. The waste collection schemes in Cambridge City Council and South Cambridgeshire District Council are presented in Table 5 and Table 6 below.

Table 5: Waste Collection Information – Cambridge City Council

Waste container	Capacity of container (litres)	Materials collected	Frequency of collection
Black wheelie bin	140/240	Residual household waste	Fortnightly
White sacks	N/A	As black bin	Fortnightly
Blue bin	140/240	- Paper and card - Envelopes - Clean cardboard - Phone books and catalogues - Food tins and drink cans - Sweet and biscuit tins - Aerosol cans - Clean Foil and foil trays - Metal lids from jars - Glass bottles and jars - Plastic bottles (inc drinks, shampoo & detergent bottles – no lids) - Cartons (e.g. Tetra Pak)	Fortnightly
Recycling box		- As blue bin	Fortnightly
Green bin	140/240	- Food waste - Grass - Plant material - Untreated Wood and sawdust - Soiled cardboard - Shredded paper	Fortnightly
Brown sack	N/A	As Green bin	Fortnightly

Table 6: Waste Collection Information – South Cambridgeshire District Council

Waste container	Capacity of container (litres)	Materials collected	Frequency of collection
Black wheelie bin	240 litres	- non-recyclable waste - fruit juice cartons (with foiled lining) - plastics - polystyrene - cat litter - light bulbs - Pyrex	Fortnightly

Waste container	Capacity of container (litres)	Materials collected	Frequency of collection
Green Box (Until September 2010)	N/A	- Newspapers - magazines - junk mail - general clean paper - telephone directories (inc Yellow Pages) - catalogues - white envelopes (with or without windows) - glass bottles - aerosol cans - food glass jars (with lids removed and put with cans) - aluminium cans / jar lids / pet food cans (washed out) - biscuit / sweet tins - tin foil and foil trays - plastic bottles (remove tops and triggers)	Fortnightly
Blue Bin with inner caddy (From October 2010)	240 litres	As green box but with additional materials: - Mixed plastic - Cartons (tetra packs) - Cardboard - Glass - Aluminium foil - Cans (steel and aluminium)	
Green bin	240 litres	- Grass cuttings - Leaves, pruning's and clippings - Untreated wood and bark - Cardboard - i.e. brown cardboard boxes, toilet rolls, egg boxes and food packaging cardboard such as cereal boxes (Blue Bin from October 2010) - Brown paper - Brown envelopes (with windows removed) - Rabbit/Guinea pig waste (i.e. straw, hay and newspaper) - Windfall fruit - Cooked food - Meat and bones - Vegetables and fruit peelings - Coffee filters and tea bags - Stale bread - Food waste paper liners	Fortnightly

Although Cambridge City Council operates a kerbside recycling scheme, which collects recycling from many college-owned houses (over which the University has no jurisdiction), the University operates its own waste collection from some residential properties and can influence what containers are available in its properties. A summary of the recycling undertaken in the University colleges is provided in Table 7.

Table 7: Summary of recycling in colleges at University of Cambridge

College	Material Recycled										
	Paper	Cans	Glass	Plastic bottles	Printer cartridges	Batteries	Cardboard	Food waste	Clothes & shoes	Mobile phones	Spectacles
Christ's College	✓	✓	✓		✓	✓					
Churchill College	No current information available.										

College		Material Recycled										
		Paper	Cans	Glass	Plastic bottles	Printer cartridges	Batteries	Cardboard	Food waste	Clothes & shoes	Mobile phones	Spectacles
Clare College	Memorial Court	✓	✓	✓								
	The Colony	✓	✓	✓	✓			✓	✓			
	Old Court	No current information available.										
Clare Hall College		✓	✓	✓								
Corpus Christi College		✓	✓	✓	✓	✓	✓	✓		✓		
Darwin College	Newham Grange, Rayne Building, Old Granary	✓	✓	✓	✓							
	Newham Terrace	✓	✓	✓	✓			✓				
	Gwen Ravarat House	✓	✓	✓								
	29 Barton Road	✓	✓	✓								
	Frank Young House	✓	✓	✓								
Downing College		✓	✓	✓		✓						
Emmanuel College		✓	✓	✓								
Fitzwilliam College		✓	✓	✓				✓				
Girton College	Main site	✓	✓	✓		✓		✓	✓			
	Wolfson Court	✓	✓	✓								
Gonville and Caius College	General	✓				✓					✓	
	Harvey Court	✓	✓	✓	✓			✓				
	Old Courts	✓	✓	✓	✓			✓				
Homerton College		No current information available.										
Hughes Hall College		✓	✓	✓		✓						
Jesus College		✓	✓	✓	✓	✓		✓	✓			
Kings College	Main site	✓	✓	✓								
	Garden Hostel	✓	✓	✓								
Lucy Cavendish College		No current information available.										

College		Material Recycled										
		Paper	Cans	Glass	Plastic bottles	Printer cartridges	Batteries	Cardboard	Food waste	Clothes & shoes	Mobile phones	Spectacles
Magdalene College		✓	✓	✓	✓	✓	✓				✓	✓
New Hall College		✓	✓	✓		✓						
Newnham College		✓	✓	✓		✓	✓					
Pembroke College		✓	✓	✓		✓	✓	✓				
Peterhouse College		✓	✓	✓								
Queens College		✓	✓	✓	✓	✓	✓	✓			✓	
Robinson College		✓	✓	✓		✓					✓	
Selwyn College		✓	✓	✓	✓			✓	✓			
Sidney Sussex College		Unknown										
St Catherine's College	Island site	✓	✓	✓			✓ + CDs/floppy discs					
	St Chad's	✓	✓	✓								
St Edmunds College		Unknown										
St John's College		Unknown										
Trinity College		✓		✓		✓	✓	✓	✓ (Organic)			
Trinity Hall College	Main site	✓	✓	✓								
	Wychfield Staircases A to P	✓	✓ + metal	✓	✓			✓				
Wolfson		No current information available										

Further details can be obtained from "A Guide to Recycling at University in Cambridge".

Consultation

4 Consultation

4.1 Liaison with Local Authorities (Waste Task Group)

Cambridgeshire County Council is the Waste Disposal Authority (WDA) for the area in which the development is situated; they are therefore responsible for provision of recycling centres throughout the region, recycling or disposal of waste collected at recycling centres, and disposal of non-recyclable residual waste collected by the District Councils.

South Cambridgeshire District Council and Cambridge City Council are the Waste Collection Authorities (WCA) for the development and responsibilities include: the kerbside collection of household and bulky waste, provision of recycling points, recycling arrangements for recyclables collected, disposal of parks and public garden waste, removal of fly-tipping waste, street cleaning, environmental health issues and waste education for schools.

A number of consultation meetings with the Waste Task Group led by Cambridgeshire Horizons have been held during 2009 and 2010 to discuss the Proposed Development. This group comprises the following stakeholders:

- AECOM (Sustainability and waste advisors)
- South Cambridgeshire District Council
- Cambridge City Council
- Cambridgeshire County Council
- Cambridgeshire Horizons
- University of Cambridge

The stakeholders have been given the opportunity to consider the Waste Strategy in March 2010, and have assessed the potential waste collection options (refer to Section 9).

In addition, the group has been used to help provide information on the costs of alternative waste collection schemes to contribute to the financial modelling of waste strategy options.

Waste Generation Estimates

5 Waste Generation Estimates

5.1 Construction Phase

5.1.1 Waste Arisings

The Proposed Development will include the construction of 1,500 homes for University of Cambridge and College staff, accommodation for 2,000 postgraduates, 1,500 market houses, research and development space, community facilities (including a school and food store) and a hotel. Published sources of data have been used to estimate the quantities of waste likely to be generated assuming that the Proposed Development uses traditional construction techniques with he same resource efficiency as the sample of previous developments on which this data is based. A breakdown of the potential construction phase waste generation by building type is shown in Table 8 below.

Table 8: Construction Phase Waste Generation Estimate

User	Building Floor Area (m^2)	Waste Generation Rate*	Units	Total waste generated (m^3)
Residential	320,000	0.1795	m^3/m^2	57,440
Academic/ Commercial Research	100,000	0.2666	m^3/m^2	26,660
Supermarket	2,000	0.1959	m^3/m^2	392
Retail	3,300	0.1959	m^3/m^2	646
School	3,750	0.2666	m^3/m^2	1,000
Student Housing	98,000	0.1795	m^3/m^2	17,591
Hotel	7,000	0.1998	m^3/m^2	1,399
CHP	1,000	0.1912	m^3/m^2	191
Police Touch Down	200	0.1912	m^3/m^2	38
Community Centre/Indoor Sports	950	0.2131	m^3/m^2	202
Nursery	2,000	0.2666	m^3/m^2	533
Primary Health	700	0.1979	m^3/m^2	139
Senior Living	6,500	0.1795	m^3/m^2	1,167
Car Parking	9,800	0.2087	m^3/m^2	2,045
Total				**109,443**

Source: BRE: Waste Benchmark Data by Project Type, 30 November 2009.

This assessment indicates that the total volume of construction waste which will be generated is **109,443 m^3** (rounded to 109,000 m^3 throughout the remainder of this document). However, this is based on standard waste management practices and recently completed projects. It is anticipated that through the use of a robust and challenging Site Waste Management Plan (refer to Section 6.1) this can be significantly reduced. In order to gain the required BREEAM credits (refer to Section 12), based on the above Building Floor Area of 228,700m^2 (Residential and Senior Living will be subject to Code for Sustainable Homes requirements) the total volume of waste arising must be **less than 21,040 m^3** for BREEAM assessed buildings to gain maximum credits (see section 13).

5.1.2 Waste Composition

The waste composition by building type can be seen in Table 9 based on the Proposed Development. Note that this is based on typical construction typologies and may be different for the Proposed Development depending on construction methods selected.

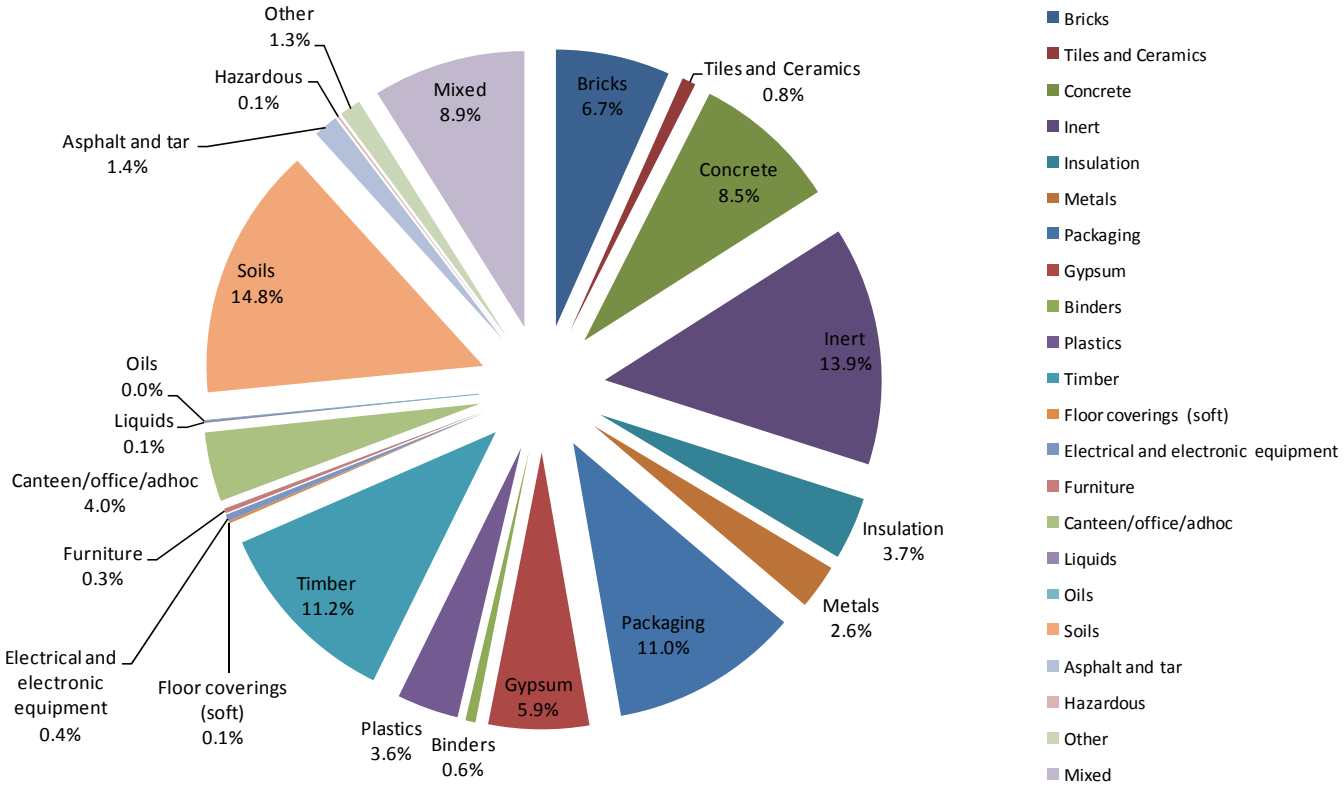
Table 9: Waste Composition by Project Type for Construction Phase

Waste Category	Resid-ential (m^3)	Academ-ic/Com-mercial Resear-ch (m^3)	Super-market (m^3)	Retail (m^3)	School (m^3)	Student Housing (m^3)	Hotel (m^3)	CHP (m^3)	Police Touch Down (m^3)	Commun-ity Centre/In door Sports (m^3)	Nursery (m^3)	Primary Health Centre (m^3)	Senior Living (m^3)	Car Park (m^3)	Total (m^3)
Bricks	4,573	990	22	33	37	1,400	105	2	1	5	20	5	93	8	**7,294**
Tiles and Ceramics	602	65	2	2	2	184	9	0	0	1	1	0	12	1	**882**
Concrete	4,893	2,363	34	50	89	1,498	130	2	1	4	47	9	99	82	**9,302**
Inert	8,579	3,398	42	64	127	2,627	15	20	10	32	68	7	174	85	**15,250**
Insulation	2,499	567	6	8	21	765	36	1	1	5	11	4	51	22	**3,999**
Metals	1,402	774	33	49	29	429	38	3	2	6	15	6	28	54	**2,870**
Packaging	7,462	1,809	21	32	68	2,285	103	8	6	18	36	17	152	44	**12,062**
Gypsum	4,118	736	14	21	28	1,261	73	2	2	6	15	14	84	44	**6,417**
Binders	448	32	1	2	1	137	10	0	0	1	1	2	9	5	**645**
Plastics	2,445	578	11	16	22	749	22	1	2	6	12	4	50	19	**3,935**
Timber	6,806	2,647	41	62	99	2,084	155	5	9	30	53	17	138	77	**12,224**
Floor coverings (soft)	58	66	1	1	2	18	5	0	0	0	1	1	1	0	**154**
Electrical & electronic equipment	227	121	1	2	5	70	8	0	0	1	2	1	5	11	**442**
Furniture	173	53	3	4	2	53	5	0	0	0	1	0	4	1	**298**
Canteen/ office/ adhoc	2,582	800	11	16	30	791	29	3	2	7	16	3	52	80	**4,422**
Liquids	80	21	0	0	1	25	21	0	1	3	0	0	2	43	**153**
Oils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Soils	5,251	6,688	64	96	251	1,608	407	136	9	29	134	31	107	1,382	**16,191**
Asphalt and tar	896	305	4	7	11	274	12	4	1	3	6	4	18	9	**1,556**
Hazardous	45	49	1	1	2	14	4	0	2	5	1	0	1	2	**125**
Other	512	510	3	5	19	157	112	0	2	6	10	0	10	27	**1,373**
Mixed	3,795	4,087	78	117	153	1,162	101	4	11	34	82	14	77	50	**9,764**
Total	**57,446**	**26,659**	**392**	**588**	**1,000**	**17,593**	**1,399**	**191**	**64**	**202**	**533**	**139**	**1,167**	**2,046**	**109,357**

Source: BRE: Waste Benchmark Data by product for different project types, 15th January 2010.

Figure 2 presents the breakdown of waste composition. Estimates of the composition of the waste have been taken from published sources of data. The waste breakdown indicates how the total waste produced per annum may be segregated.

Figure 2: Waste Composition for the Construction Phase



***Note**: Miscellaneous = Tiles and Ceramics, Binders, Floor coverings (soft), Electrical and electronic equipment, Furniture, Liquids, Oils, Hazardous.*

5.2 Occupancy Phase

5.2.1 Waste Arisings

The proposed development will incorporate residential, commercial/retail, academic, educational and industrial uses. Published sources of data have been used to estimate the quantities of waste likely to be generated when the development is occupied.

The total anticipated waste generation for the proposed development is **6,091 tonnes** of waste per annum (Note units – **m^3** are used during the construction phase, and **tonnes** during the occupation phase).

Table 10: Occupancy Phase Waste Arisings for the Proposed Development.

User	Building Floor Area (m^2)	No. of People*	Waste Generation Rate*	Units	Total waste generated (tonnes per year)
Residential	320,000	8,590	0.5	(t/person/yr)	4,295
Academic/ Commercial Research	100,000	4,310	0.096	(t/person/yr)	414
Supermarket	2,000		0.03	(t/m^2/yr)	60
Retail	3,300		0.03	(t/m^2/yr)	99
School	3,750	466	0.027	(t/person/yr)	13
Student Housing	98,000	2,000	0.5	(t/person/yr)	1,000
Hotel	7,000	130	0.55	(t/bed/yr)	72
Police Station	200		0.03	(t/m^2/yr)	38
Green/Open Spaces	75,090		0.0005	(t/m^2/yr)	29
Local/Community Centre	950		0.03	(t/m^2/yr)	6
Nursery	2,000	207	0.027	(t/person/yr)	11
Primary Health Centre	700	10	1.13	(t/person/yr)	50
Senior Living	6,500	100	0.5	(t/person/yr)	4,295
				Total	**6,091**

*Sources: Residential/Student Housing/Senior Living: Defra; Local Authority Municipal Waste Statistics, November 2007

http://www.Defra.gov.uk/environment/statistics/wastats/archive/mwb200607a.xls

Academic/Commercial Research: Waste Watch; Resource management in the education sector, 2005

http://www.ecocampus.co.uk/downloads/Wastewatch.pdf

Supermarket / Retail / Police Station / Local Community Centre : Envirowise; EN336 Reducing Waste and Utility Use in Managed Shopping Centres, March 2002
School/ Nursery: Waste Watch; Resource management in the education sector, 2005.
http://www.ecocampus.co.uk/downloads/Wastewatch.pdfhttp://www.ecocampus.co.uk/downloads/Wastewatch.pdf

Hotel: Kiely, G. (1998) Environmental Engineering, (Singapore; McGraw-Hill)

Green / Open Spaces: Public Health Engineering; CIBSE Guide G

Primary Health Care: Environews; Hospital Waste and Environmental Hazard and Its Management, Vol 5 No. 3, July 1999 http://isebindia.com/95_99/99-07-2.htmlNo. of people based on AECOM assumptions.

5.2.2 Waste Composition

A breakdown of the waste composition by materials for the proposed development is outlined in Table 11 and Figure 3.

Table 11: Waste Composition by Project Type for Occupancy Phase

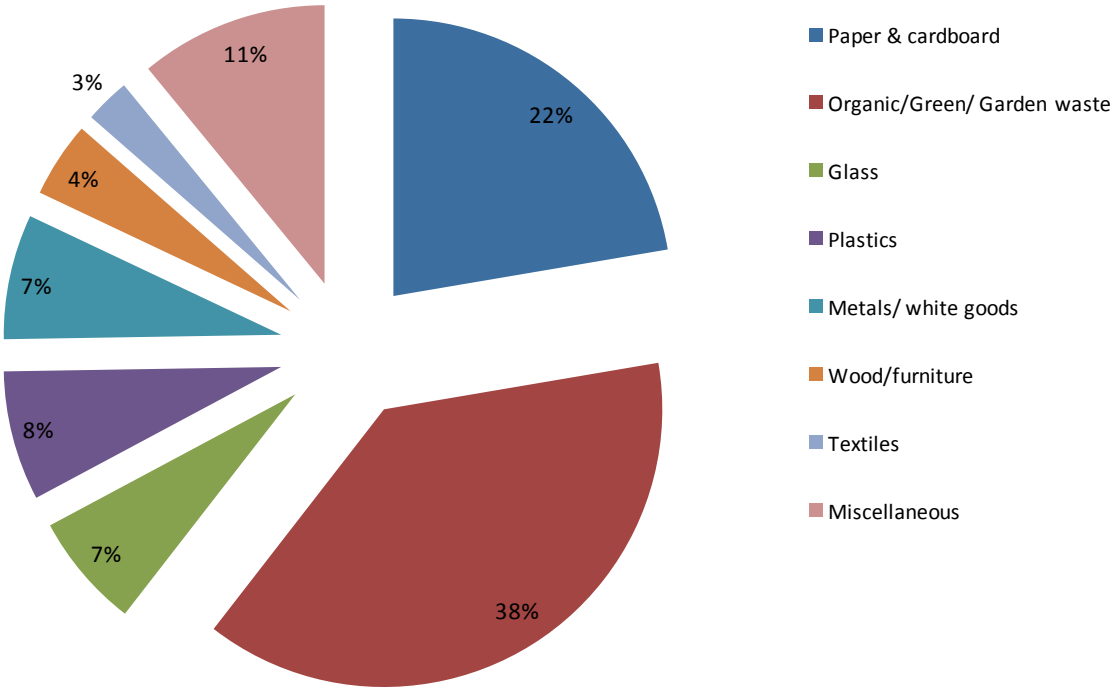
Waste Category	Residential Waste Produced (t/yr)	Academic/ Commercial Research Waste Produced (t/yr)	Super-market Waste Produced (t/yr)	Retail (t/yr)	School/ Nursery Waste Produced (t/yr)	Student Housing Waste Produced (t/yr)	Hotel Waste Produced (t/yr)	Police Touch Down	Community Centre/Indoor Sports Waste Produced (t/yr)	Primary Health Care (t/yr)	Senior Care Waste Produced (t/yr)	Green /Open Space Waste Produced (t/yr)	Total Estimated Waste Produced (t/yr)
Paper & cardboard	773	228	44	72	9	180	18	4.38	16	6	9		1,359
Organic/ Green/ Garden waste	1,718	74	8	14	6	400	39	0.84	5	2	20	38	2,326
Glass	301	17	2	3	1	70	9	0.21	1	0	4		407
Plastics	301	70	3	4	1	70	1	0.27	5	1	4		460
Metals/white goods	344	8	1	1	0	80	4	0.09	1	0	4		443
Wood/ furniture	215	0	0	0	1	50	0	0.00	0	0	3		268
Textiles	129	0	0	0	0	30	0	0.00	0	0	2		160
Miscellaneous	515	17	2	3	0	120	0	0.21	1	1	6		667
Total	**4,295**	**414**	**60**	**99**	**18**	**1,000**	**72**	**6**	**29**	**11**	**50**	**38**	**6,091**

Sources:
***Residential, Senior Living**: Defra; Municipal Waste Management Survey, 2003/04*
http://www.Defra.gov.uk/environment/statistics/waste/kf/wrkf18.htm
***Commercial, Retail, School, Nursery,Primary Health Care:** Kiely, G. (1998) Environmental Engineering, (Singapore; McGraw-Hill).*
Academic/Commercial Research: *Waste Watch; Resource management in the education sector, 2005*
http://www.ecocampus.co.uk/downloads/Wastewatch.pdfhttp://www.ecocampus.co.uk/downloads/Wastewatch.pdf

CHP: Based on Defra BEATv2 software. Waste generation estimates are based on ash production from a Biomass CHP unit. This is illustrated as a worst case scenario.

The current proposed strategy for the Application Site comprises gas CHP and therefore any waste levels arising from the energy centre will be minimal.

Figure 3: Waste Composition – Occupancy Phase



5.3 Waste Streams Responsibilities and Controls

The waste composition information presented in previous sections gives an indication of the overall potential of the development as a whole. However, household municipal waste is collected and treated by the Local Authority (in this case both South Cambridgeshire County Council and Cambridge City Council), whereas producers of commercial/retail/industrial waste will have the choice of setting up agreements with the councils or a private waste management contractor. A significant factor to be taken into consideration when developing a waste strategy is where the responsibility and control of different waste streams lies. In this way, when assessing the potential of different collection, recycling and composting schemes and on-site waste treatment technologies, the waste streams will have to be considered separately and different scenarios of managing options for the different waste streams assessed.

It is anticipated that the LA would be responsible for the residential dwellings (including student accommodation), the University for the public open space, and all commercial development related waste would be the responsibility of the producer and therefore they would be required to arrange private waste collection contracts. These contracts may be subject to influence by the University through leases allowing greater control over collection systems used and factors such as recycling.

Table 12: Responsibility of waste by category

Waste Category	LA Responsibility Waste (t/yr)	Commercial and University Responsibility Waste (t/yr)
Paper & cardboard	962	397
Organic/Green/ Garden waste	2,138	188
Glass	374	33
Plastics	374	86
Metals/ white goods	428	16
Wood/furniture	267	1
Textiles	160	0
Miscellaneous	641	25
Total	**5,345**	**746**

Figure 4: Composition of Local Authority responsibility waste

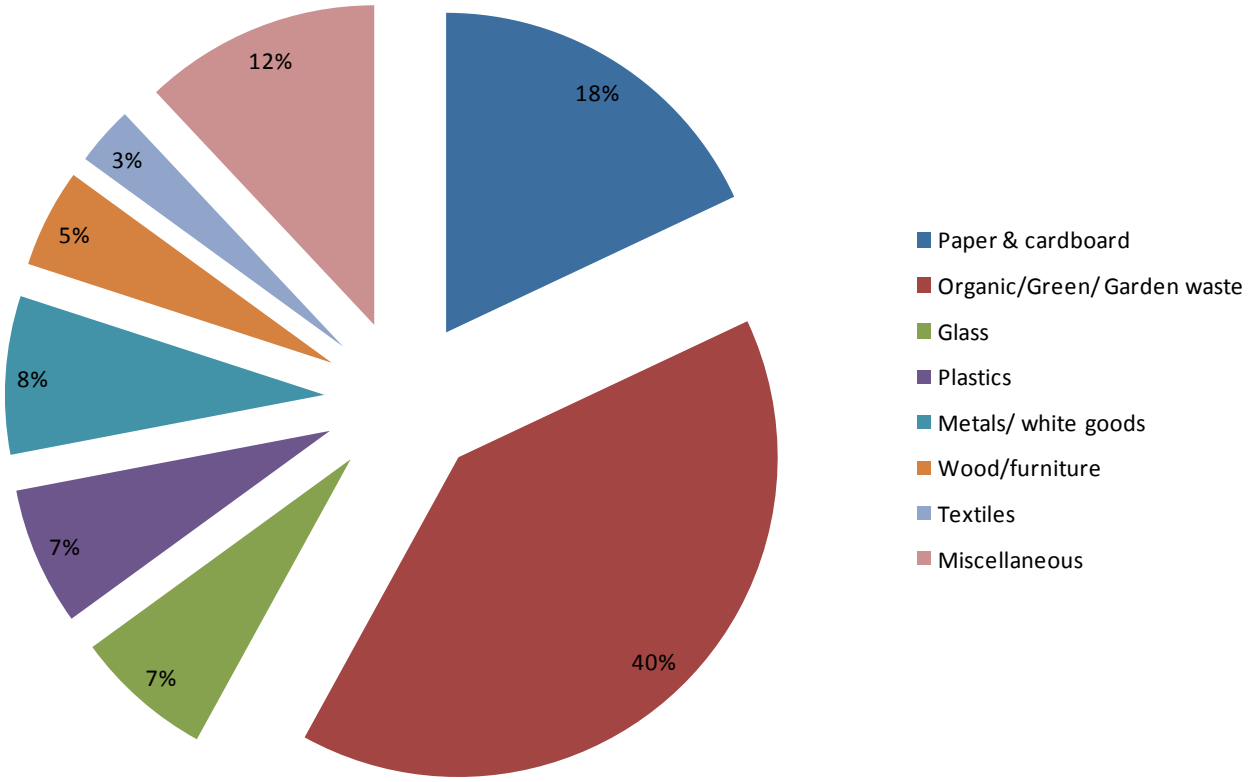
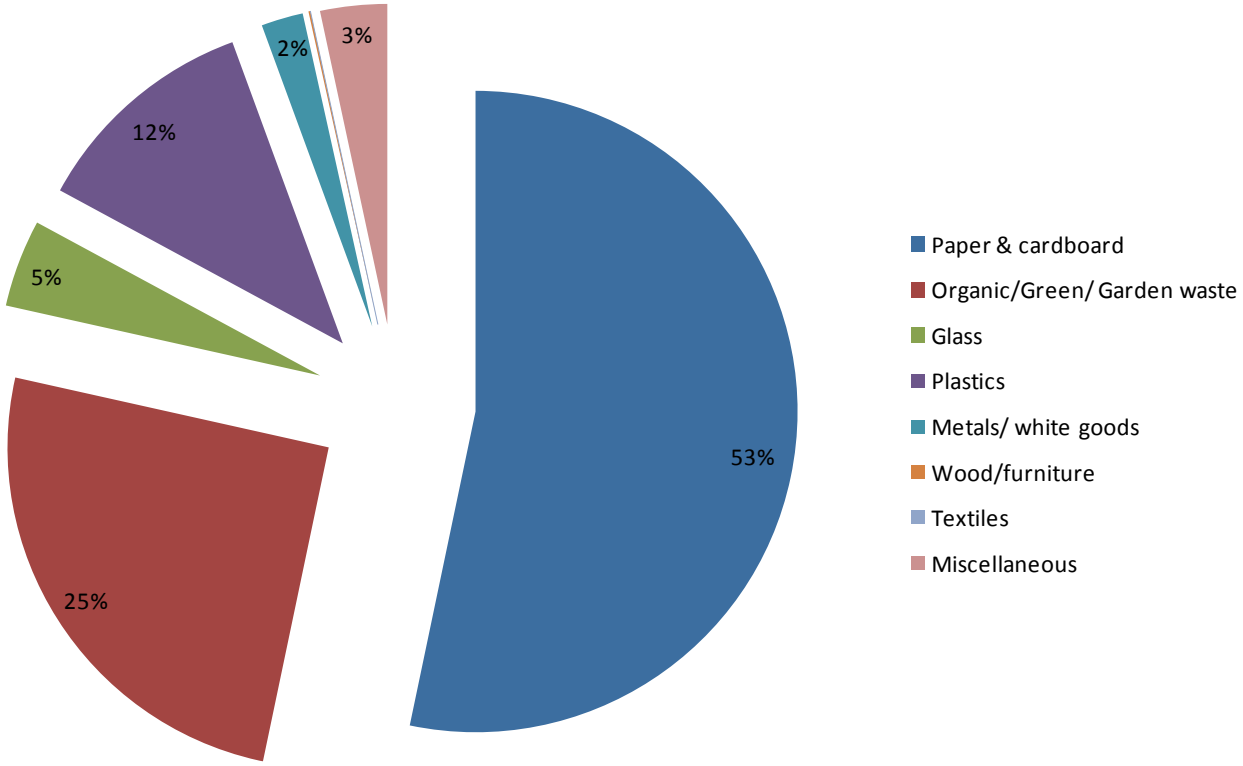


Figure 5: Composition of Commercial and University Responsibility waste



Construction Phase Waste Management

6 Construction Phase Waste Management

6.1 Introduction

Section 5.1.1 outlines the average volume of waste that could be expected for a typical development of this size as being 91,272 m^3. However, in order to meet the relevant BREEAM targets it will be necessary to set a limit of less than 20,863 m^3 of waste in the construction phase. This will require a robust materials management system to be implemented and building designs that will significantly limit the volume of waste likely to be produced on site.

6.2 Site Waste Management Plan

It is a legal requirement that during the construction, demolition and excavation stages of the Proposed Development, a Site Waste Management Plan (SWMP) is implemented which would promote resource efficiency and waste minimisation during construction and realise significant cost and environmental benefits associated with reducing waste. SWMPs are now a mandatory requirement in England on construction projects with a build cost in excess of £300,000.

Committing to sustainability in a SWMP can have environmental and financial benefits. By managing excavation, demolition and construction waste the principles of the waste hierarchy and sustainable resource and waste management can be supported. Examples of 'Good Practice' during the demolition and construction phases of the development are outlined below (this list is not exhaustive):

- 'design out' waste;
- use construction materials with a high recycled content;
- use of recycled construction materials;
- specify standard sizes in design, thus avoiding unnecessary off cuts;
- carefully plan ordering of construction materials;
- when commissioning construction contractors make it a requirement to use 'take back' schemes of unused materials and packaging waste;
- employ contractors that can demonstrate commitment to sustainable procurement;
- segregate waste that is produced to maximise reuse and recycling; and
- minimise generation of hazardous waste such as through selection of materials.

6.3 Designing out waste

In order to minimise waste production it is essential that waste be considered at the design stage. The detailed design of the site will aim to reduce waste through appropriate materials specification and construction methodologies.

6.4 Waste Segregation and Phasing

It is proposed that 'best practice' be followed during the demolition and construction phase of the development in relation to segregation of waste to help ensure BREEAM and Code criteria are achieved. Sufficient space should be allocated to allow segregation of construction and demolition waste; however the location will be dependent on constraints in the working area of the site.

Utilising waste stream colour coding will aid segregation of waste at source. This can take the form of different coloured signs on bins or skips indicating which waste stream can be accepted in each receptacle. The Institution of Civil Engineers has developed a generic colour coding scheme for the construction industry; it is planned that this system is used during construction of the Proposed Development.

Phasing the 'stripping out' of any existing buildings during demolition will have potential for greater recycling / reuse of material. This is when different materials, such as wood, metals, concrete etc are individually removed, therefore resulting in better segregation of materials, which can aid recovery, reuse and recycling.

6.5 Reuse and Recycling On and Off Site

During the construction stage the SWMP will be reviewed and updated. At this stage the principal contractor will be leading the SWMP and will be responsible for ensuring all sub-contractors work to the requirements of the SWMP. The detailed

requirements for waste management on the site will depend on the construction processes used which will only be known once the detailed design commences.

Excavated materials from site may be used elsewhere within the construction works provided that they are uncontaminated and fit for purpose. The current development proposals allow for a balance of cut and fill on the site, ensuring that there is no export of materials form the site, or import of materials. Excess material generated on the site will be used for the landscaping along the western edge.

6.6 Waste Treatment On and Off Site

Policy CS 28 of the '*Cambridgeshire & Peterborough Minerals and Waste Core Strategy'* states that in order to assist with reuse and recycling of materials, on or off site waste treatment should be undertaken including the use of temporary waste recycling facilities if appropriate. The use of onsite waste treatment facilities; such as mobile treatment plant to recycle aggregate or treat contaminated soils will be utilised for large amounts of materials where appropriate and viable. For smaller quantities off site treatment would be more appropriate.

6.7 Options Appraisal

The relevant options for the construction phase have been considered in Table 13 below.

Table 13: Construction Phase Options Appraisal

Option	Description	Pros	Cons	Conclusion
Pre-fabrication	Assembling pre-constructed components on site reducing waste and therefore the requirement for raw materials.	Waste minimisation as well as time and cost benefit to the project.	Buildings will need to be designed in context of pre-fabricated materials available – potentially restricting design options.	This will be further considered in the detailed design stage.
Standard sized materials	Utilisation of standardised range of materials in order to minimise wastage.	Standardised materials will reduce the generation of off cuts and therefore reduce the volume of waste.	Standardising materials across building may limit design options.	This will be further considered in the detailed design stage.
Setting of targets and Key Performance Indicators (KPIs)	Setting of Targets and KPIs for waste production and landfill diversion in the contract documents.	The use of challenging targets and KPIs can focus the Principal Contractor on the effective waste management and drive waste minimisation.	-	Targets and KPIs will be included in the Development Briefs.
Preparation				
Reuse of materials	If any demolition works are undertaken re-processing of the waste stream could provide recycled aggregate.	Minimise the use of raw materials and waste.	On site processing may not be practicable for small volumes and it is expected that demolition at the Application Site will be very limited.	Reprocessing of excavation and demolition waste will be required in the Development Briefs where viable.
Cut and fill	There is an option to	Balancing these would	This may impact on	This will be implemented

Option	Description	Pros	Cons	Conclusion
	balance the amount of 'cut and fill' material throughout the development. Consideration should be given to the construction programme to ensure this is achievable.	provide waste savings and reduce amounts of imported fill required on site.	design levels, which could have implications, such as drainage and flood risk or visual and acoustic screening.	as far as possible. This is subject to detailed design of the site. It is currently intended that excess topsoil will be used for landscaping and the construction of noise bunds.
Treatment of contaminated land	Contaminated land (if present) may be remediated either onsite or offsite using in-situ treatment, mobile treatment or removal to an offsite treatment facility.	This would allow the reuse of materials, and negate the requirement for 'capping' materials which are often used over contaminated land.	Removal of materials offsite would increase traffic movements and therefore impact on the sustainability of the project. Onsite treatment may have time implications and may only be practical for large volumes.	Ground investigation works demonstrate minimal levels of contamination with low levels of benzo(a)pyrene only encountered in one sample of Made Ground. On-site remediation of localised areas of contamination will be conducted where viable.
Construction				
Waste Segregation	Use of clearly labelled receptacles including use of colour coding, or segregation off site.	Focuses minds of site workers on waste management. Segregation minimises waste being sent to landfill thus reducing costs.	Sites are sometimes not big enough to incorporate a waste compound of sufficient size to segregate waste.	SWMP will require segregation of waste to maximise landfill diversion.
Training	Waste management to form part of the site induction and toolbox talks.	Focuses workers on appropriate waste management and increases segregation of waste materials.	Additional time taken in training	SWMP will require waste management to form part of the site induction and toolbox talks.
Supplier 'take back' scheme	Materials suppliers will be required to enter into contract to take back waste packaging such as pallets.	This allows reuse of pallets and promotes recycling (through bulking waste) and therefore diverts waste from landfills.	May limit the suppliers that can be used.	This will be a requirement for suppliers.

6.8 Summary

A Site Waste Management Plan (SWMP) will be implemented, as required by law, for the Application Site. This will commit the project to sustainable waste management for the construction phases through the appropriate management of the excavation, demolition and construction waste stream. The SWMP will also encourage resource efficiency in order to reduce potential waste streams.

There will be an opportunity to use best practice in waste segregation and phasing of the project in order to maximise reuse, and recycling opportunities during the construction phase of the development, which will be undertaken either on site or off site depending on the volume of waste produced.

Challenging waste minimisation and landfill diversion targets will be set via Development Briefs with the aim of reducing the volume of waste produced by more than half compared to the standard development of this size, thus gaining maximum BREEAM credits (Refer to Section 12).

Waste Storage Capacity

7 Waste Storage Capacity

7.1 Introduction

To assist with the management of occupancy phase waste, it is important that adequate internal and external waste storage is provided for all parts of the development and which is appropriate to the building use, size and number of occupants. Housing developers will be required to provide suitable facilities for waste segregation within all residential dwellings to provide facilities for recycling, and appropriate facilities will be required in all non domestic buildings.

7.2 Residential Areas

7.2.1 Internal Storage Capacity

The RECAP Guide requires that an internal capacity of 35 to 40 litres be provided for waste segregation within residential properties, allowing segregation of residual waste, mixed dry recyclables and organic waste streams.

The Code for Sustainable Homes (refer to Section 12) requires that if there is a Local Authority Collection scheme with at least fortnightly collection (as is the case for the development), then one of the following requirements must be met:

- if recyclable household waste is sorted after collection - a single 30 litre bin should be provided;
- if materials are sorted before collection – at least 3 bins should be provided, total capacity of 30 litres (minimum capacity of at least 7 litres per bin) in adequate internal space; or
- an automated collection system is provided which collects at least 3 different types of recyclables.

In the case of the Proposed Development it will be necessary to provide space for 3 internal bins with a total capacity of 35 to 40 litres (minimum capacity of at least 7 litres per bin). This volume will be the minimum, and depending on the final waste strategy which will be finalised at detailed design, larger internal capacities may be required to allow internal storage for longer periods or for more streams.

A list of typical internal bin sizes as contained in Appendix A of the RECAP Guide and is reproduced in Table 14 below.

Table 14: Examples of internal waste container types

	Container type	Typical Dimensions (mm)
Single Compartment Examples – Freestanding	40 litre bin (semi-cylindrical)	435 (l) x 302 (w) x 716 (h)
	30 litre bin (cylindrical)	722 (h), 293 (Ø)
	20 litre bin (cylindrical)	717 (h), 251 (Ø)
	38 litre bin (cuboid)	400 (l) x 310 (w) x 648 (h)
	45 litre bin (cuboid)	400 (l) x 280 (w) x 737 (h)
Multi-Compartment Examples – Freestanding	2 compartments 30 litre capacity (1 x 19 litre and 1 x 11 litre housed in one unit)	47 (l) x 25 (w) x 44 (h)
	Three compartments 33 litre capacity (3 x 11 litre housed in one unit)	47 (l) x 25 (w) x 44 (h)
Multi-Compartment Examples – Fitted	Three Compartments 40 litre capacity (1 x 19 litre, 1 x 12 litre and wire frame housing)	For installation in hinged door cabinets. To fit cabinet with minimum of 500mm horizontal clear space and a height of 525mm.
	Four compartments 39 litre capacity (1 x 12 litre and 3 x 9 litre seated in single wire frame housing)	For installation in hinged door cabinets. To fit cabinet with minimum of 500mm horizontal clear space and a height of 525mm.
	Three compartments plus 2 cleaner baskets – 43.2 litre capacity (1 x 18 litre and 2 x 8.5	For installation in drawers or door front fixing cabinets. Minimum 433mm depth and height of 320mm.

	litre plus 2 x 4.1 cleaner baskets housed in one unit)	

Source: Appendix A, RECAP Partnership: Waste Management Design Guide, Recycle for Cambridge and Peterborough, Draft SPD for consultation, February 2010.

7.2.2 Future-proofing for internal storage

It would be sensible to 'future-proof' the Proposed Development for potential future waste storage requirements, with the possibility of a wider range of segregated recyclables/organic waste being collected. Upon consultation with the WCAs it was suggested that the Government would be likely to require separate collection of food waste in the future. It is therefore proposed that in addition to the required internal storage space suggested above, space suitable for an additional internal waste storage bin should be provided for food waste in all dwellings.

7.2.3 External Storage Capacity

The Building Regulations (Part H6) state that the WCA has powers under Section 46 (Receptacles for household waste) and Section 47 (Receptacles for commercial or industrial waste) of the Environmental Protection Act 1990 to *"specify the type and number of receptacles to be used and the location where the waste should be placed for collection. Consultation should take place with the WCA to determine their requirements".*

The RECAP Guide states that as a minimum the developer should provide sufficient space for external waste storage containers. It also emphasises that developers must provide external storage containers / financially contribute to the Local Authority (LA) for their provision; and must ensure that the containers are provided at each property before LA waste collection service commences.

The RECAP Guide recommends minimum external storage capacities for residential developments as summarised in Table 15 below.

Table 15: Typical external storage container requirements

Residential Development Type	**Aggregated Capacity Provision**		**Guidance Notes**
Single House	775 litres		Capacities detailed are maximum capacity 'footprints'. Developers should ensure that sufficient space is provided for the appropriate external storage containers. The relevant Local Authority must be consulted on capacity split and the types of external storage containers that the developer will be required to provide. It should be noted that capacity 'footprints' and splits will change over time as each Local Authority works towards national targets.
Low-rise (to 4 floors) with communal gardens	For each 1 room unit	320 litres	
	For each 2 room unit	420 litres	
	For each 3 room unit	520 litres	
	For each 4 room unit	620 litres	
	For each 5 room unit	720 litres	
Low-rise (to 4 floors) without communal gardens	For each 1 room unit	240 litres	
	For each 2 room unit	340 litres	
	For each 3 room unit	440 litres	
	For each 4 room unit	540 litres	
	For each 5 room unit	640 litres	
High-rise (above 4 floors)	For each 1 room unit	240 litres	
	For each 2 room unit	340 litres	
	For each 3 room unit	440 litres	
	For each 4 room unit	540 litres	
	For each 5 room unit	640 litres	

In order to achieve Code credits, houses are required to provide external space for recyclable waste with 3 bins having a minimum capacity of 180 litres, no bin being smaller than 40 litres.

Blocks of flats should have adequate external space capable of storing at least 3 types of waste and be sized according to the frequency of collection. The Code specifies that a provision of 100 litres of external household waste storage should be allocated as adequate storage space for a single bedroom dwelling, with a further 70 litres required for each additional bedroom.

There are several ways to achieve the required capacity for external storage, and these are discussed in Section 8.

A list of typical external bin sizes as contained in Appendix A of the RECAP Guide and is reproduced in Table 16 below.

Table 16: Examples of external waste container types

Receptacles	Container type and capacity
Two-wheeled Containers and Boxes	140 litre wheelie bin
	240 litre wheelie bin
	360 litre wheelie bin
	55 litre box
	38 litre box
Four-wheeled Containers	1280 litre
	1100 litre
	820 litre
	770 litre
	660 litre
	500 litre

7.2.4 Future-proofing for external storage

It would be sensible to 'future-proof' the development for additional future waste storage requirements, with the possibility of a wider range of recyclables/ organic waste to be collected. Upon consultation with the WCAs it was suggested that the government would likely require separate collection of food waste in the future. Depending on the proposed waste collection strategy for the site (see later), it may be necessary to design the storage and collection facilities to take an additional organics waste stream.

7.3 Commercial development

7.3.1 RECAP Guide Internal Segregation and Storage Requirement

The RECAP Guide recommends total waste storage capacities for commercial developments. Table 17 below outlines the typical storage requirements.

Table 17: Total waste storage capacities for Commercial developments

Commercial Development Type	Waste Storage Capacity	Fraction of Capacity for Storage of Recyclables
Offices	2600 litres per 1000m gross floor space	Minimum of one third
Retail	5000 litres per 1000m gross floor space	Minimum of one third
Restaurants/ Fast-food Outlets	1500 litres per 20 dining spaces	Variable
Hotels	5000 litres per 20 dining spaces	Variable

7.3.1.1 BREEAM Guide Internal Segregation and Storage Requirements

BREEAM Retail (refer to Section 13.2.2) requires provision of dedicated storage facilities for a minimum of 6 different types of recyclable waste streams during the operation phase. The dedicated space should: provide clear labelling for recycling, be placed within accessible reach of the building, and sized according to number and area of retail units and predicted waste volumes.

BREEAM Office (refer to Section 13.2.3) requires provision of adequate space should be allocated for storage of recyclable materials, with the following demonstrating compliance:

- A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following:
  - Clearly labelled for recycling;
  - Placed within accessible reach of the building;
  - In a location with good vehicular access to facilitate collections.

- The space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/ operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum:
  - At least $2m^2$ per $1000m^2$ of net floor area for buildings < $5000m^2$;
  - Minimum of $10m^2$ for buildings ≥5000 m^2;
  - An additional $2m^2$ per $1000m^2$ of net floor area where catering is provided (with an additional minimum of $10m^2$ for buildings ≥$5000m^2$).

BREEAM Retail (refer to Section 13.2.2) also requires for provision of dedicated storage facility for a building's operational-related recyclable waste streams. The following demonstrates compliance:

- A dedicated storage space to cater for the volume of recyclable materials generated by the retailer(s) during operation. The dedicated space must cater for the separation and storage of a minimum of 6 different types of recyclable materials, these must include:
  - Paper
  - Cardboard
  - Plastics (including packaging film)
  - Other packaging materials (not covered above)
  - Glass (segregated into brown, green and clear glass)
  - Metals
  - Batteries
  - Timber
  - Fluorescent lamps
  - Vegetable oils
  - Mineral oils
  - Food waste

Note: For assessment s of building/units for service providers please refer to the Compliance Notes.

- The dedicated space is:
  - Clearly labelled recycling;
  - Placed within accessible reach of the building;
  - Sized according to the number and area of retail units that it will serve and then predicted volumes of waste that will arise from those areas;
  - In a location with good vehicular access to facilitate collections.

Typical footprint dimensions for recyclable storage areas for Retail and Offices as outlined in the BREEAM guidance are provided in Table 18 below.

Table 18: Typical footprint dimensions for recyclable storage areas

Waste Receptacle Type		**Area required**
Compactor		4.8m x 2.4m
Skip		$8m^2$
Wheeled bins	360 litre	0.86 m x 0.62m
	660 litre	1.2m x 0.7m
	1100 litre	1.28m x 0.98m
Roll-on-roll-off containers		6.1m x 2.4m
Vehicle access	Dustcart	Length = 7.4m, Height = 4m Width = 3.1m
	Skip Lorry	Length = 7m, Height = 3.35m Width = 3.1m

Note: Consideration must also be given to any other types of vehicle requiring access to this area e.g. lorries for roll on/off containers.

BREEAM Industrial recognises that provision of adequate space should be allocated to allow storage of recyclable materials during occupancy with the following as a minimum:

- For units with an unknown end occupier (i.e. speculative units), space provided for a hard standing area for at least 1 standard 8 cubic yard skip for operational areas of <1000m^2 and for 2 standard 8 cubic yard skips for units with operational areas of ≥1000 m^2, also at least 2m^2 per 1000m^2 of net office floor area.

- For units with a know occupier (such as fitted out units), space provided for hard standing area to enable occupier to recycle material, at least 2m^2 per 1000m^2 of net office floor area for buildings <5000m^2 with a minimum of 10m^2 for buildings ≥5000m^2, plus a dedicated space for separation and storage of paper, cardboard, glass, plastics, packaging, metals, timber and other process related recyclable waste.

For typical footprint areas for recyclable storage as outlined in BREEAM Industrial please refer to Table 18 above.

Waste Storage/Collection Systems

8 External Waste Storage/Collection Systems

8.1 Introduction

In this section it is intended to assess the potential options for storing and collecting waste produced during the occupancy phase. There are numerous innovative methodologies for collecting and storing waste, the viability of which is dependent upon various factors; including population density, land availability and collection arrangements.

For the purposes or this section of the report the development has been split into the following categories based on the perceived viability of the storage and collection options:

- High density residential areas, comprising flats and apartments producing municipal waste;
- Medium density residential areas, comprising terraced houses and town houses producing municipal waste;
- Low density residential areas, comprising detached and semi-detached houses producing municipal waste; and
- Commercial/industrial areas, incorporating all areas producing non-municipal waste.

Section 9 considers which of these options is most appropriate for the Application Site.

8.2 Waste Storage Points

The RECAP guide requires developers to make adequate arrangements with regard to waste management collection points making them convenient for the user and accessible to the WCA without presenting a health and safety risk. For communal waste storage points the developer must make adequate provision for the management and maintenance of these areas.

8.2.1 Low and medium density residential

The RECAP guide states that wherever possible, waste storage points should:

- Be housed within a designated area or structure as appropriate;
- Be easily accessible to the occupier;
- Not have to be moved through a building to the collection point;
- Be located in a shaded position and away from windows; and
- Be located in a well ventilated area.

In addition the following should be observed:

- Residents should not have to move waste more than 30m to any designated storage area (this is guidance in RECAP, the Code for Sustainable Homes, and a requirement of building regulations).
- The designated storage area should not be more than 30m from the collection point;
- Collection crews should not have to transport two wheeled bins further than 25m, or four wheeled bins more than 10m;
- Passage of a wheeled container should avoid steps, but where not possible should avoid transfer over more than 3 steps; and
- In all cases the gradient should not exceed 1:12.

8.2.2 High density residential

Conventionally waste is transported by residents to a waste storage compound either in the building or within the grounds. As above, the RECAP guide states that Collection Crews should not have to transport four wheeled bins more than 10m. The mode of collection should be based upon:

- User convenience and efficiency;
- Health, safety and security; and
- Environmental risk.

The RECAP guide aims to promote the use of innovative and creative methods for the management of waste from high density residential dwellings.

8.2.3 Commercial/industrial

For commercial/industrial developments similar methodologies are prevalent to those outlined above in Section 8.2.2. However the exact methods for the storage and collection of waste are dependent upon the activity being undertaken on the premises.

8.3 Low density residential storage and collection options

8.3.1 Wheelie Bins

The standard method for low density housing is the traditional 'Wheelie Bin' type waste storage. As outlined above (Section 8.2.1) the RECAP guide puts certain restrictions on travel distances and siting. Wheelie Bins are often considered to be an eye-sore, and as such it would be preferable to screen them in the grounds of the properties, or else house them within a structure. One possibility is housing them with the bike storage which is a requirement of the Code.

Table 19: Advantages/Disadvantages of Wheelie Bins in low density residential areas

Advantages	Disadvantages
Lowest cost option requiring no significant infrastructure	Visual intrusion
Good for security due to being stored on private premises	Space requirements
Fits in with current WCA methods and working practices	

8.3.2 Above ground communal storage sites

This system comprises the placement of bins in convenient locations with the number and size of bins to account for the population that the storage site serves. The scheme works as a bring centre for the neighbourhood, allowing the WCA to collect from fewer locations. This scheme is not routinely used for low density residential areas in the UK but is common in parts of Europe and for high density housing in the UK.

It is important that the internal waste storage capacity is appropriate for a communal storage system. It is possible that a larger internal storage volume is suitable than recommended by the Code and RECAP, to provide additional storage between visits to the communal bins.

Table 20: Advantages/Disadvantages of above ground communal storage sites in low density residential areas

Advantages	Disadvantages
Lower operational costs than door to door collections	Visual intrusion
Lower carbon footprint in terms of "waste miles" due to central collection location	Space requirements
If use 1,100litre Eurobins, the WCAs have suitable collection vehicles.	Resident transport distances will potentially be in excess of the 30m given in RECAP, the Code, and Building Regulations.
Versatile system in terms of size and number of bins allowing better segregation if required.	Cultural shift for UK population.
	Potential security issues.
	Management and cleanliness of storage compounds can be an issue if not monitored and maintained.

The RECAP guide specifies construction requirements for above ground communal storage compounds as detailed in Table 21.

Table 21: Design specifications for waste storage compounds

Feature	Design
Walls and Roofs	To be made of a non-combustible, robust, secure and impervious material with a fire resistance of 1 hour (as tested in accordance with BS 476-21)
Floors	To be made from a hard impervious material with a smooth finish and a minimum thickness of

Feature	Design
	100mm. There should not be any steps or projections at the entrance.
Doors	Width to be 1.8m – 2m (minimum). To be made of steel or of some other material with a fire resistance of 30 minutes (as tested in accordance with BS 476-22). Should also be self-closing except where they communicate directly with the outside air. Should be hung so that hinges are not damaged where the doors are allowed to swing ride. Should be capable of being opened from the inside and outside to prevent the risk of individual users becoming trapped.
Door Frames	To be metal, hardwood or metal clad softwood. Door frames should also be situated in the external wall and rebated into the reveals of the opening.
Junctions of Walls with Floors	To be covered with the coving formed to prevent damage to the walls from the containers – in accordance with BS 1703.
Drainage	To be via a trapped gully connecting to the foul sewer. Floors should have an appropriate fall towards the drainage point.
Ventilation	Areas for ventilation to be situated as near to the top and bottom of the container as possible with the total ventilation area to be less than $0.2m^2$.
Lighting	Electrical lighting to be provided by bulkhead fittings within the storage compound with housings rated to IP65 in BS EN 60529:1992. Luminaires to be low energy light fittings and switching should be via proximity detection or time delayed.
Cleansing	A hose union tap with water supply should be provided at the compound.
Access Paths	Should be a minimum of 2m wide and feature a hard finished surface.

8.3.3 Underground communal storage sites

As with the above system, this involves a communal bring site, but with the waste receptacles placed underground with only the disposal apertures present above ground. This has the advantage of reducing visual intrusion and saving space. There are primarily two types of underground storage, Vertical Deep Bins and Hydraulic Underground Bins.

The communal nature of underground bins means that they would generally need to be located within 30m of relevant properties (although there are occasions where this may be exceeded by a small amount and accepted under building regulations, the Code, and RECAP, and confirmed through the waste task group meetings). This method of collecting, requiring the resident to transport waste from their home to the bins, is a departure from the traditional wheelie bin model usually found for houses, but similar to the current situation of bin compounds in flats. Further analysis is required at the detailed design stage on exactly how the bins would be located and methods will need to be provided where a particular resident, for example through disability, is unable to carry their waste.

8.3.3.1 Vertical Deep Bins

Vertical deep collection locate the main waste collection vessel under gorund with only a small entry bin on the surface.. Container sizes can range from 3,000 to 5,000 litres. Users access the bins via a small chute, with the number of chutes depending upon the number of fractions to be collected.

The emptying of the deep collection containers is achieved either via collection vehicles utilising hydraulic cranes which lift the receptacles from the ground. Alternatively a hydraulically raised platform can be used, but this limits the collection volume to that of a conventional Euro-style bin, reducing the advantages of the potential large collection volumes. The frequency of emptying

can be dependent upon the size of the container; some companies have fitted electronic sensors to the bins to alert the collection company when the bin is becoming full.

The dimensions of Underground storage systems as outlined in Appendix A of the RECAP Guide are included in Table 22.

Table 22: Underground storage system dimensions

Unit Capacity	Typical Dimensions (mm)
$3m^3$ Capacity	Below Ground Component (l x w x h) 1430 x 1430 x 1604 Above Ground Component (l x w x h) 900 x 620 x 890 Ground Area Required 1720 mm^2
$4m^3$ Capacity	Below Ground Component (l x w x h) 1430 x 1430 x 2139 Above Ground Component (l x w x h) 900 x 620 x 890 Ground Area Required 1720 mm^2
$5m^3$ Capacity	Below Ground Component (l x w x h) 1430 x 1430 x 2674 Above Ground Component (l x w x h) 900 x 620 x 890 Ground Area Required 1720 mm^2

Table 23: Advantages/Disadvantages of underground communal storage sites in low density residential areas

Advantages	Disadvantages
Lower operational costs than door to door collections	Resident transport distances potentially in excess of the 30m given in RECAP, the Code, and Building Regulations.
Lower carbon footprint in terms of “waste miles” due to central collection location	Cultural shift for UK population and waste operation authorities (although this system is currently being tested in many local authorities across the UK).
Space saving/lower collection frequency through greater storage volumes	Would not be as easy to modify for changes to collected waste segregation which require an additional segregated stream.
Waste is kept cool as it is underground, protected from sunlight and high daytime air temperatures.	May require new collection vehicles or modification of existing vehicles for deep bin storage depending on the system selected.
Only chute opening is visible. The waste storage area is completely underground minimising the visual impact of the compound significantly compared with many individual dwelling bins.	Question over who is responsible for maintenance of hydraulic system (hydraulic raise systems only).
High bulk density for deep bins – due to the vertical design gravity forces the waste to compact itself.	Potentially not suitable if there is a high water table although most systems use a cast concrete container which is impervious to water.
The systems are designed to minimise vandalism.	Excavation and civil/mechanical works required to install mean higher capital cost although these are reduced on a new development where existing civils work is being conducted.
Visible locations encourage residents to use the correct bin for each waste stream and not to ‘fly-tip’ waste around the location.	For deep bins, cannot install in an enclosed space or where there are overhead obstructions due to lifting requirements.
Extensive operation experience in Europe, with this system being used across whole local authorities in some countries.	Chute size may restrict objects that can be placed in the bin. However a large number of chute design variations are available.
Sealed chutes prevent the escape of odours and stop waste being blown in the wind.	
Access control possible using a tag system which restricts the residents to their appropriate bins.	

8.3.4 In-sink macerators

Biodegradable waste may be disposed of through installation of in-sink disposal units in residential properties. In-sink disposal units, usually located as part of the kitchen sink, are electrically-powered devices located between the sink's drain and the trap which shred food into parts small enough to pass through the plumbing system. This will enable diversion of organic waste from bins, therefore reducing the total volume of waste produced during occupancy.

However, this will result in a greater burden on the sewerage undertaker. Following consultation with the WCAs it has been stated that Anglia Water's (the sewerage undertaker) present sewerage infrastructure would not be able to accommodate the burden of organic waste from in-sink macerators. The use of in-sink units can also increase water consumption (which would be potable due to their location in a kitchen sink).

As such this option is not considered further in the report.

8.4 Medium density residential storage and collection options

8.4.1 Wheelie Bins

As with low density housing, Wheelie Bins are the standard waste storage methodology in the UK for medium density housing. However, the increased density of the accommodation and the decrease in space means that the visual intrusion is even greater.

8.4.2 Above ground communal storage sites

System as with Section 8.3.2, but may be more suited to have a communal area per block of townhouses. Dependent upon the size of the block, it is possible to comply with the RECAP Guide's guidance on resident travel distances though careful locating.

8.4.3 Underground communal storage sites

System as with Section 8.3.3, but may be more suited to have a communal area per block of townhouses. Dependent upon the size of the block, it is possible to comply with the RECAP Guide's guidance on resident travel distances though careful locating.

8.5 High density residential storage and collection options

8.5.1 Above ground communal storage sites

This system is the standard system for flats and apartments. The communal storage site can be located either in the building, minimising visual intrusion, or in a dedicated outdoor compound which maximises internal space, but creates a visual intrusion.

The resident transport distances are not an issue for flats and apartments in the RECAP guide.

Table 24: Advantages/Disadvantages of above ground communal storage sites in high density residential areas

Advantages	Disadvantages
The WCAs have suitable collection vehicles.	Balance between visual intrusion/Space requirements
Standard method in UK.	Potential security issues if the compound is outside the building.
Versatile system in terms of size and number of bins allowing better segregation if required.	Management and cleanliness of storage compounds can be an issue if not monitored and maintained. Residents tend not to look after the storage areas.

An Above ground communal storage scheme may be best suited to the student accommodation, where a number of central waste storage areas are provided for the disposal of waste from student rooms, but where management is not seen as an issue due to these areas only being accessed by staff (for example, cleaners), and not individual residents.

8.5.2 Underground communal storage sites

Systems are described in Section 8.3.3. Please see Table 23 for a full list of advantages and disadvantages. In higher density residential areas, the distance to communal bins is not an issue.

8.5.3 Disposal Chutes

Disposal chutes are typically used in high density residential accommodation such as flats or apartments in excess of four floors. The chutes will be accessed on each floor by a hopper door. There is an option to segregate the waste through use of a 'shaft separator' for different waste streams, or use of automated systems which allow the resident to choose via a system of buttons which waste they are depositing at the hopper. At the end of the chute the waste will either be collected by a sorting arm to be disposed in the appropriate container, or the containers will revolve below the chute to provide the relevant container to the waste stream.

This system will typically require large waste receptacles, which could be combined with a waste compaction system to reduce the frequency of bin collection, or size of receptacles.

The waste will need to be collected in the building in an area which can be gravity fed from all chutes.

Table 25: Advantages/Disadvantages of disposal chutes in high density residential areas

Advantages	Disadvantages
System can be set-up to allow segregation of waste streams, aiding recycling rates.	Separate chute systems may be difficult to modify if the fractions to be collected are altered.
Reduces resident transit distances to the point of disposal.	A higher degree of management and maintenance would be required from the building management provider than in the case of resident transport.

8.5.4 Automated Pneumatic Waste Collection System

Automated centralised Pneumatic waste collection systems work on the principle of collecting waste in dedicated pipelines under suction to a central waste handling facility, thus reducing the requirement for vehicle movements.

A typical automated centralised suction system comprises a network of collection points that are linked together by piping to a central collection station. Segregated waste streams are each disposed of down a separate chute. The collection points can be located either inside communal areas within the apartment blocks or in external public areas, however the higher the number of collection points the higher the cost of the system. At the collection station there is the option to utilise compaction in order to reduce the frequency of collection.

The system can be expanded to take in public areas and commercial developments, with waste all being handled at a central hub. This system would require regular maintenance and management to ensure that bins at the collection station are emptied as required and collection points remain in good working order.

Table 26: Advantages/Disadvantages of automated pneumatic waste collection systems in high density residential areas

Advantages	Disadvantages
Ability to co-collect commercial and residential waste.	Very high capital costs.
Avoidance of waste storage in buildings.	Potential loss of jobs in the waste collection system.
Reduced vehicle movements and emissions.	Who is responsible for management and maintenance of the system?
Minimise space required to store refuse.	May not be suitable for all waste streams [such as glass].

Lower total collection cost over the system lifetime (but high maintenance costs may counteract this).	Very little track record of schemes in the UK with high maintenance requirements (and hence costs) for trial schemes.
Eliminates the visual and odorous impact of refuse bins.	Suited to very high density development (for example, inner city). These schemes are not suited to lower density developments such as the Proposed Development.
Bulking of segregated waste streams.	
Reduced visual impact of waste management.	

8.5.5 Compaction

Compaction equipment can be used to reduce the waste volume, thereby decreasing the frequency of waste collection required. This has the potential to reduce the number of heavy vehicle movements, thus decreasing the related noise and air pollution.

Typically compaction would not be used in residential scenarios such as residual municipal waste from houses. However it may be suitable for communal areas of blocks of flats or halls of residence where larger volumes of waste will be collected to a single location. The commercial developments at the Application Sitemay also have the opportunity to utilise compaction equipment; whether this is suitable will depend on the waste generated and collection contractor employed.

The use of compaction for residential development will be considered in conjunction with waste collection systems, disposal chutes and automated waste collection systems.

Table 27: Advantages/Disadvantages of compaction systems in high density residential areas

Advantages	Disadvantages
Reduced vehicle movements and potentially space requirements.	Less flexible system to modify to changed segregation in waste collection.
	Management and maintenance would be required from the building management provider.
	System would need to be enclosed to inhibit noise impacts
	Potential health and safety impacts
	High capital cost
	May require alternative WCA collection vehicles.

8.6 Commercial/industrial waste storage and collection options

8.6.1 Above ground storage compound

The system is the same as described in Section 8.3.2 and comprises a series of large bins for the segregation of recyclable wastes. The materials to be segregated will be dependent upon the users own contract with a waste management company, and could therefore be different to the WCA schemes.

Table 28: Advantages/Disadvantages of above ground storage sites in commercial/industrial areas

Advantages	Disadvantages
Standard method in UK.	Potential security issues if the compound is outside the building.
Versatile system in terms of size and number of bins allowing better segregation if required.	Visual impact of bins and bin compounds.

8.6.2 Underground storage sites

The systems are described in Section 8.3.3. The advantages and disadvantages listed in Table 23 mostly apply to the use of these systems in commercial areas. A key consideration would be the specific waste streams produced by each building. Whilst an underground system may be suited to the more general waste streams, other specific waste types (for example waste chemicals) or bulky waste streams may require an additional solution.

8.6.3 Bailing and Compaction

Segregated waste streams can be compacted to minimise volume of waste. Bailing/Compaction equipment will be a requirement where possible for commercial/industrial areas due to the need to gain BREEAM credits as detailed in Section 13.

Waste Storage and Collection Options Viability Assessment

9 Waste Storage and Collection Options Viability Assessment

9.1 Introduction

Section 8 outlines the external waste storage and collection options for the development. This section of the report assesses the viability of these options against stated criteria to provide additional insight to the selection of options.

9.2 Methodology

In an attempt to undertake a quantitative and impartial decision making process, a systematic scoring matrix was used to help quantify the viability of the options in each scenario. The options are scored on a 1 to 5 basis for the following criteria:

Table 29: Assessment Criteria

Assessment Criteria	Description of Criteria
Proven technology/waste management method	Extent of use in the UK.
Avoidance of visual intrusion	Scope for “hiding” waste management infrastructure from public view.
Ability to apply in a phased approach	Assessing whether the option can be implemented in a phased approach.
Integration with existing waste management methodologies	Assessment of whether the option involves standard practice in terms of waste management in the area.
User friendly	Ease of use for residential and commercial customers.
Adaptability of system	Flexibility to allow ‘Future Proofing’.
Infrastructure requirements	Requirements for capital outlay in terms of infrastructure and plant.
Security	Ability to prevent unauthorised use of the facilities.
Neatness	The ability of the system to achieve a clean and tidy waste management area e.g. avoidance of loose rubbish around receptacles.
Innovation	How innovative the system is compared to the default system.
Capital Cost	The upfront costs required to install/operate the system.
Operational Cost	The ongoing costs concerned with operating and maintaining the system.
Management	The need for ongoing management and maintenance of the system.

A full description of the scoring system is included in Appendix D. The key assessors were identified as:

- AECOM (in the role as waste management sustainability consultant and representing the University)
- South Cambridgeshire District Council and Cambridge City Council (waste collection authorities); and
- Cambridge County Council.

The waste storage/collection options for each type of development assessed are outlined below:

- Low Density Residential
    - Conventional resident transit utilising “wheelie bins”
    - Above ground communal storage
    - Communal underground hydraulic bins
    - Communal underground vertical bins
- Medium Density Residential
    - Conventional resident transit utilising “wheelie bins”
    - Above ground communal storage
    - Communal underground hydraulic bins
    - Communal underground vertical bins
- High Density Residential
    - Above ground communal storage
    - Communal underground hydraulic bins
    - Communal underground vertical bins

- Disposal Chutes to an underground waste compound
- Automated Pneumatic Waste Collection
- Compaction System

- Commercial/industrial/education
  - Use of Above Ground Waste compound
  - Communal underground hydraulic bins
  - Communal underground vertical bins

The strategy for student accommodation will be partially dependent on who operates the accommodation. Whilst the densities may be similar to high density residential, many of the issues in the residential sector encountered around management of waste facilities will not feature in managed student accommodation.

Based on the scores provided by the assessors the options were ranked for each assessor (#1 being the highest rank and therefore preferential). An aggregate of the rank was taken to identify the preferred options taking into account each assessor's opinion.

The intention of this methodology is not to obtain the preferred strategy, but to provide additional information which can be used to help form the preferred strategy, and identify potential issues which need to be resolved. It is likely that the methodology will identify different options for different parts of the site, but in reality a single strategy is more likely to be favoured (as is currently the case in the majority of locations, even when it may not be the most appropriate solution for specific typologies).

9.3 Assessment Results

The waste storage/collection options for each type of development were assessed by the key stakeholders. The viability assessment results based on information received are summarised in Table 30 and presented in full in Appendix E.

Table 30: Viability Assessment results

Assessment Criteria	AECOM		Cambridge City Council		Cambridgeshire County Council		South Cambridgeshire Council	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Low Density Residential								
Conventional resident transit utilising "wheelie bins"	170	1	193	1	Did not provide scores		Did not provide scores	
Above ground communal storage	163	2	127	4				
Communal underground hydraulic bins	163	2	155	3				
Communal underground vertical bins	163	2	165	2				
Medium Density Residential								
Conventional resident transit utilising "wheelie bins"	165	4	193	1	Did not provide scores		Did not provide scores	
Above ground communal storage	166	3	127	4				
Communal underground hydraulic bins	171	2	155	3				
Communal underground vertical bins	173	1	165	2				
High Density Residential								
Use of Above Ground Waste compound	165	3	143	5	Did not provide scores		Did not provide scores	
Communal underground hydraulic bins	171	2	155	4				
Communal underground vertical bins	176	1	165	2				
Disposal Chutes to an underground compound	157	4	161	3				

Automated Pneumatic Waste Collection	135	5	169	1		
Compaction System	122	6	0	6		
Commercial/Industrial/Education						
Use of Above Ground Waste compound	176	1	Did not provide scores		126	2	Did not provide scores
Underground hydraulic bins	156	3			136	1	
Underground vertical bins	161	2			123	3	
Note. Highlighted items are the top scorers in each category.						

*

Table 31: Ranking Assessment

Assessment Criteria	AECOM Rank	WCA/WDA Rank	Aggregate Rank*
Low Density Residential			
Conventional resident transit utilising "wheelie bins"	1	1	2
Above ground communal storage	2	4	6
Communal underground hydraulic bins	2	3	5
Communal underground vertical bins	2	2	4
Medium Density Residential			
Conventional resident transit utilising "wheelie bins"	4	1	5
Above ground communal storage	3	4	7
Communal underground hydraulic bins	2	3	5
Communal underground vertical bins	1	2	3
High Density Residential			
Use of Above Ground Waste compound	3	5	8
Communal underground hydraulic bins	2	4	6
Communal underground vertical bins	1	2	3
Disposal Chutes to an underground compound	4	3	7
Automated Pneumatic Waste Collection	5	1	6
Compaction System	6	6	12
Commercial/Industrial/Education			
Use of Above Ground Waste compound	1	2	3
Underground hydraulic bins	3	1	4
Underground vertical bins	2	3	5
Note. Highlighted items are the top scorers in each category.			

9.4 Discussion and summary

9.4.1 Low Density Residential

Conventional resident transit using wheelie bins was the preferred waste storage/collection option for low density residential development for all stakeholders. It is worth noting that AECOM scored above ground communal storage, communal underground hydraulic and vertical bins highly in equal second place. Communal underground vertical bins were second most preferential based on the aggregate ranking.

The preference for wheelie bins is partially driven by the perceived issues around distances from homes to storage areas, and also the current prevalence of this method. The results should also be considered in the context of the whole development, such that an optimal scheme for the whole site may not be comprised of optimal schemes for each area-type.

The selection of the conventional system for low density residential is possibly also influenced by existing development types, including older homes, where densities of 10 – 15 homes / ha are common across large areas. The “low density” areas of the Proposed Development will have higher densities than this,and be collocated with high density areas, supporting the use of a communal system.

9.4.2 Medium Density Residential

Cambridge City Council scored wheelie bins highest for medium density residential, whilst AECOM scored communal underground hydraulic bins highest. Overall AECOM and Cambridge City Council score the communal underground vertical bins option highest based on the aggregate ranking.

9.4.3 High Density Residential

Communal underground storage options are preferred by AECOM, with vertical bins being the highest scorer. Cambridge City Council scores use of an automated pneumatic waste collection system highest as a waste collection option with communal underground vertical bin options being scored second highest. The aggregate ranking therefore favoured communal underground vertical bins.

9.4.4 Commercial/Industrial/Education

Cambridgeshire County Council as WCA provided assessment for the commercial/industrial/education criteria due to their responsibility for this waste stream scoring underground hydraulic bins highest. AECOM scored the use of above ground waste compound highest

The aggregate ranking scores from AECOM and Cambridgeshire County Council favour the use of above ground waste compounds for commercial/industrial/education waste.

Recycling Infrastructure

10 Recycling Infrastructure

10.1 Introduction

The increase in population caused by the development will inevitably put pressure on the waste recycling infrastructure in the locality, and as such must be considered at the Outline Planning stage.

10.2 Bring Sites

The RECAP Guide suggests that developers assess the impact of their proposals on existing bring site facilities and whether it creates the need for new bring sites in the local area. In Cambridgeshire the financial contributions will be calculated on a per dwelling basis where additional bring sites are not provided on the development. RECAP further suggests that the provision of underground recycling points be considered. An underground recycling bank facility (similar to the system described in Section 8.3.3) has the advantage of being less visually intrusive and provides more accessibility to those with restricted mobility. (Underground collection systems are discussed in the options appraisal).

Bring sites will need to be allocated within the development, utilising areas such as the supermarket site and other areas convenient to dwellings and other land uses. The RECAP Guide states that Local Planning Authorities will require one Bring Site per 800 households where the first facility will be operational on occupation of the 800th property, whilst temporary facilities will be required during the construction phase on occupation of the 50th property.

Temporary and permanent bring sites should be located to provide easy and convenient access (at least 20m from residential dwellings), whilst also being accessible for service vehicles and avoiding damage to overhead services during collection. Therefore bring sites will be required within the development.

10.3 Recycling Centres

The RECAP guide outlines that developers will not be expected to construct new household recycling centres, however they may be expected to contribute land or financially towards either the upgrading of existing household recycling centres or provision of new recycling centres.

The Core Strategy allocates land at Cambridge North East to serve the North of Cambridge whilst replacing the existing Milton site. Discussions with the Waste Disposal Authority state there is not a need to include a Household Recycling Centre within the development but a financial contribution will be required.

With a number of recycling centres already operational in the local area, there is no requirement for the Application Site to host an additional centre.

Waste Disposal and Treatment Options

11 Waste Disposal and Treatment Options

11.1 Introduction

Traditionally in the UK waste has been sent to landfill after collection, however with the move to complying with the waste hierarchy of reduce-reuse-recycle-recover, the introduction of EU legislation and the consequential introduction of the Landfill Allowance Trading Scheme (LATS) there is a push towards diversion of waste from landfill and treating the residual waste (i.e. waste that cannot be recycled).

In this section the main treatment technologies are assessed and their viability for use within the development discussed.

11.2 Composting

Composting is a natural biological treatment process, through which biodegradable organic matter aerobically decomposes into a stabilised residue known as compost. The biodegradable fraction of the feedstock is decomposed by bacteria and to a lesser extent fungus, using oxygen from the air and releasing carbon dioxide.

This process is a sustainable way of recycling nutrients within the waste feedstock and produces a natural soil improver. Carbon contained within the waste organic matter is either converted to carbon dioxide or remains within the compost as stable (largely non biodegradable) residue. As a waste treatment option composting ensures that (the majority of) the biodegradable fraction of the waste is aerobically decomposed, producing a stable residue. This helps prevent the potential for methane which is produced from the anaerobic decomposition of waste. Methane is a powerful greenhouse gas which has about 21 times the impact on climate change as carbon dioxide. Furthermore, anaerobic decomposition of waste can lead to odour impacts from the waste, which are minimised by controlled composting.

Composting has a number of advantages and disadvantages compared to alternative methods of waste treatment, these are summarised below.

Advantages

- Sustainable form of resource management – recycles nutrients in waste organic material providing a natural fertiliser and soil conditioner (potentially for domestic gardens or allotments).
- On-site composting minimises the need for transport to alternative waste treatment facilities therefore reduction in 'waste miles' and carbon emissions.
- Composting waste minimises the production of methane from waste and therefore the release of greenhouse gasses.
- Well managed composting will minimise potential odour issues from biodegradable wastes.
- Composting provides a relatively cheap solution to managing site generated green wastes.

Disadvantages

- Risk of odour and vermin problems from poorly managed composting.
- No potential for energy production.

There are many different types of composting equipment, which can be vary from small scale home composting bins to industrial composting, as discussed below. Depending on the type and scale of composting activity to be undertaken, an Environmental Permit may be required.

If organic waste from residential properties is used as feedstock, this could include food waste which would be subject to the Animal By-Products Regulations (ABPR). According to the ABPR, the treatment of animal by-products should be approved by Defra (for England and Wales) and the approval enforced by the local authority; complying with the ABPR would impose stringent criteria for thermal cycles to ensure any pathogens were destroyed in the process.

11.2.1 Home Composting

Small scale composting can be undertaken domestically through use of a various types of composting bin. Households would be able to home compost all suitable biodegradable waste which would aid the reduction in environmental impact of waste disposal from the development.

Composting bins for home compost can include wormeries and closed composting bins. Provision of space for composting bins is a requirement of the Code for Sustainable Homes and it will be required on this development for all houses with suitable sized gardens. Residents should be encouraged to home compost all suitable wastes, garden and kitchen / food wastes (excluding animal products). Dwelling without gardens will produce minimal compostable waste, largely limited to kitchen waste, and will therefore use the organic waste collection system.

Collection of segregated domestic green waste by the Local Authority is an acceptable alternative to communal/ community composting facilities in the Code.

11.2.2 Central / Industrial Composting

A larger scale composting facility could provide a central on-site waste treatment for the development. This could be in the form of windrows or in-vessel composting. A summary of these composting methods is included in Table 32 below.

Table 32: Composting technology summary

Composting Technology	Description
Windrows	Windrow composting is an established technique for dealing with collected garden wastes; material is shredded and then piled in elongated rows, called windrows, and aerated through either turning of the windrows or by air forced through the material. Windrow composting generally takes place outdoors and is the least costly form of aerobic digestion. There are other similar techniques, such as static pile composting, where air is forced through the waste mass to promote biodegradation.
In-vessel Composting	In-vessel composting (IVC) embraces a variety of techniques whereby source segregated biowastes or the organic fraction from mixed Municipal Solid Waste (MSW) are initially composted in an enclosed vessel or tunnel, generally followed by a period of further composting outdoors. The advantage of these processes is that the vessel is designed to achieve and maintain specified temperatures to facilitate pathogen destruction.

It is understood that the Applicant will retain ownership/control of public open spaces, and would therefore produce significant volumes of green waste. On site composting of this would be a cost effective and sustainable way to manage site waste. There is an added advantage that the resultant compost could be applied back on the green spaces.

11.2.3 Viability of Composting on the Development – options appraisal

Option 1: Household Scale Composting Bins
For residential dwellings with suitable sized gardens, suitable scale composting bins will be provided within the property. Residents will be encouraged to home compost all suitable wastes, garden and kitchen / food wastes (excluding animal products) to help reduce the impact of waste disposal from the development.

The available feedstock for household scale composting is outlined in Table 33 below.

Table 33: Feedstock for Household Scale Composting

Waste Type	Residential (t/yr)
Organic/Green/ Garden waste	1,417

Households will be able to use the compost from this scale of facility within their own gardens, minimising 'waste miles' and therefore carbon emissions from waste management. Although achievable for properties with gardens, it is likely that this would be unsuitable for flats such as student housing, unless there is green space or gardens provided.

Option 2: Composting Green Waste from public open spaces
Organic waste arisings such as grass cuttings and pruning from maintenance of the public open space would be suitable for composting. This waste stream expected to be produced from the public open space is **75 tonnes per year** upon completion of the development. This would allow for use of composting technology such as aerated piles, and windrows. In either case space should be allocated for the composting and it could be screened to avoid visual intrusion.

Option 3: Composting Green Waste from public open space and commercial and industrial waste
There is a potential to compost green waste, from the public open space as discussed in Option 2 above, along with commercial / industrial waste from the development; which would provide approximately **213 tonnes per year** upon completion of the development. The commercial/industrial waste stream may contain waste from on-site catering which can consist of (but not limited to) fruit and vegetable peelings, plate scrapings as well as cooked and uncooked meat and fish products. This would increase the volume of feedstock, with catering waste increasing the daily supply of organic waste required in continuous batch processes such as in-vessel composters.

However, combination of these two waste streams would require the facility to comply with Animal by-Product Regulations (due to the probable presence of animal by-products in the catering waste). In addition, composting of catering waste containing meat products will be required to be approved by Defra. Windrows cannot be used for treatment of catering waste except as a second stage following in-vessel composting.

A range of small scale in-vessel composters are available and these should be encouraged in the commercial developments, or wherever catering waste is produced. Table 34 shows "The Rocket® Composter" range of in-vessel composters giving and an indication of their capacity and size.

Table 34: "The Rocket® Composter" in-vessel composter details

Composter Type	Capacity	Dimensions	Suitability
A500 Rocket Composter	- 600 litres of mixed waste per week - 300 litres of food waste per week - 1200 litres of food waste per week if used with macerator / dewaterer.	Length: 2.0m Width: 0.7m Height: 1.4m	Schools, business offices, restaurant or 50 households.
A700 Rocket Composter	- 1400 litres of mixed waste per week - 700 litres of food waste per week - 2100 litres of food waste per week if used with macerator / dewaterer.	Length: 3.0m Width: 0.9m Height: 1.5m	Catering establishments, colleges, community composting groups or 115 households.
A900 Rocket Composter	- 3500 litres of mixed waste per week - 1750 litres of food waste per week - 5250 litres of food waste per week if used with macerator / dewaterer.	Length: 4.0m Width: 1.0m Height: 1.6m	Universities, large scale community composting, Food manufacturers, or 290 households.
A1200 Rocket Composter	- 7000 litres of mixed waste per week - 3500 litres of food waste per week - 10500 litres of food waste per week if used with macerator / dewaterer.	Length: 6.0m Width: 1.2m Height: 1.8m	High Volume on site disposal applications, 580 Households.

One BREEAM credit is available for composting for the BREEAM Retail and Education schemes. In order to comply with the assessment criteria, the following should be demonstrated:

- A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use;
- There is adequate space for storing segregated food waste and composted organic material;
- At least one water outlet is provided for cleaning in and around the facility; **or**
- Where there are space or access limitations on site, the following demonstrates compliance:
  - There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility;
  - At least one water outlet is provided for cleaning in and around the facility.

A single larger scale composter could be included in the development to take all commercial catering waste in the development, or a series of smaller scale composters at each facility to reduce waste miles and the need for centralised management.

Option 4: Composting waste from public open space, commercial/industrial and local authority responsibility waste
Another option to increase the amount of waste to be composted would be to include all the waste from the development, third party waste such as the organic waste from the public open space, commercial/ industrial, and residential properties. This would increase the potential organic waste stream to **2,036 tonnes per year**. This would provide added sustainability and financial benefits, but due to the presence of catering waste would still need to conform to Animal by-Product Regulations.

11.2.4 Composting – options for further consideration

This section examines a number of options for on-site composting. The options which will be taken forwards for further consideration at detailed design are:

- Inclusion of compost bins in all private gardens for garden and kitchen waste
- An in-vessel composting unit for waste from public open space and commercial buildings kitchen waste. Discussions with food store operators will also promote this to the food store.
- The use of local council composting facilities at Donarbon for homes and buildings without on-site composting availability. This will be collected as part of the MSW and recyclables collection strategy.

11.3 Anaerobic Digestion

Anaerobic Digestion (AD) is a natural process of microbiological conversion of organic matter in absence of oxygen. AD has traditionally been used for the treatment of wastewater, however more recently it has been applied for the treatment of the biodegradable fraction of solid waste.

Anaerobic digesters typically can accept any biodegradable material as feedstock such as organic waste including food waste, green waste, waste paper, animal waste, agricultural residues and sewage. Anaerobic digesters consist of an airtight tank that may be heated and / or mixed. The process produces:

- Biogas which typically contains an average of 60% methane and 40% of carbon dioxide, and trace amounts of other gases
- Digestate: a liquid and solid residue

The amount and quality of biogas and digestate vary according to the feedstock, however the more putrescible the feedstock material, the higher are the biogas yields from the system.

11.3.1 Viability of AD for the development

Feedstock for AD can include a wide range of organic materials, such as food waste, sewage sludge and biomass. The wastes anticipated to be produced at the development that are suitable to be treated using AD include green waste from the University owned public open space, sorted / separately collected fractions of MSW (including kitchen and green waste) and organic waste from the commercial and industrial development (from canteen waste).

AD plants currently in use typically have a capacity of between 2,000 to 60,000t/yr, although for commercial operation, plants are typically around 1 MWe or more requiring upwards of circa 30,000t/yr. Waste produced from the public open space would produce **75 t/yr** of organic waste, combined with commercial waste/ industrial would provide **213 t/yr** and from the whole development including residential waste **2,036t/yr**. With waste streams of 75 t/yr and 213 t/yr, AD would not be a feasible choice of treatment technology. Only when utilising the residential (local authority responsibility) waste streams would AD become feasible, however as this is at the lower end of the capacity then feedstock supply security would be critical to any decision to commission an AD plant in the development area. Any energy output from a scheme of this size would be negligible in relation to the overall site demands.

Both WCAs have separate collections of organic waste (food and green waste) which is treated by the WDA's contractor Donarbon utilising an In-Vessel composter at the Waterbeach waste management park. It is therefore considered that this technology would not be suitable for this development due to insufficient feedstock.

11.4 Energy from Waste

There is a variety of energy from waste treatment technologies that could treat waste generated from the development. However the technologies most appropriate to the type and scale of the development were considered and their suitability assessed based on technical feasibility. The two energy from waste technologies which were considered are Pyrolysis/ Gasification and Incineration.

11.4.1 Pyrolysis / Gasification

Pyrolysis is a thermal process which uses high temperatures to break down hydrocarbon containing waste in the absence of oxygen. The absence of oxygen is essential to prevent combustion of organic material at process temperatures.

The process subjects waste to high temperatures (typically between 350^0C – 800^0C) which initially drives off any water and volatile components present in the feedstock. The high temperature degrades organic material in the waste into simple hydrocarbons, pyrolysis oil, synthetic gas (often referred to as Syngas) and a residual solid. The solid residue is comprised of carbonaceous char and inorganic material not decomposed by the process.

The gasification process is similar to pyrolysis; the key difference between gasification and pyrolysis is that in gasification limited amounts of oxygen (air) and / or steam are introduced to partially combust / react with the waste and promote decomposition.

Gasification produces a fuel gas from the organic feedstock, known as 'Producer Gas'. The gas produced includes organic gases, as produced in pyrolysis, but will also include a higher concentration of carbon monoxide and hydrogen. The addition of steam promotes the 'Water Gas' reaction, which increases levels of carbon monoxide and hydrogen in the gas produced. Steam will also react with carbon present in char to form carbon monoxide and hydrogen, minimising solid residue and increasing the yield of fuel gas.

Systems can combine pyrolysis and gasification stages; initially pyrolysis can be used for the feedstock, followed by gasification of residual char. This maximises the conversion to fuel gas and minimises the carbon content of solid residue.

The fuel gas (syngas or Producer Gas) can be combusted to generate electricity potentially using a CHP system to increase the thermal efficiency of the system. Alternatively fuel gas could be converted into methane, or hydrocarbon synthetic fuel; however this would require significant processing to synthesise the fuel and would only be feasible on a large scale.

The key stages of a pyrolysis / gasification waste treatment system are:

- Pre-treatment;
  - Sorting, removal of recyclables and unsuitable materials, and
  - Shredding, reducing the size of waste to a suitable range
- Thermal processing, to produce a fuel gas, solid residue and potentially hydrocarbon oil.
- Gas treatment, fuel gas can be cleaned to remove impurities (such as particulates and condensed oils).
- Utilisation, Syngas used as a source of energy for power generation or CHP.

11.4.2 Incineration

Incineration is the combustion of residual waste in the presence of oxygen, typically at temperatures in excess of 850^{o}C. The waste is converted into carbon dioxide and water, and any non-combustible materials (e.g. metals, glass, stones) remain as a solid, known as Incinerator Bottom Ash (IBA) that always contains a small amount of residual carbon. Waste is combusted under controlled conditions, to reduce its volume and hazardous properties, and to generate electricity and / or heat.

11.4.3 Viability of Thermal Treatment for the development

Feedstock for pyrolysis / gasification or incineration can include a wide range of organic materials, such as plastic, paper and biomass. The wastes to be produced at the Proposed Development are suitable to be treated using pyrolysis or incineration include sorted / separately collected fractions of Municipal Solid Waste (Residual waste), including plastic and biomass (food and green waste), and commercial waste as presented in Table 35 below:

Table 35: Feedstock for Pyrolysis / Gasification and Advanced Thermal Treatment

Waste type	University Responsibility Waste (t/yr)	University and Commercial / Industrial Responsibility Waste (t/yr)	University, Commercial / Industrial and Local Authority Waste (t/yr)
Paper & Cardboard	0	459	1,277
Organic	75	143	1,960
Plastic	0	111	429
Wood/furniture	0	0	227
Textiles	0	0	136
Miscellaneous	0	30	576
Total	**75**	**743**	**4,605**

Energy from waste (EfW) technologies based around incineration or advanced thermal treatment such as gasification or Pyrolysis are generally suited to much larger schemes (in terms of energy demand) than the Proposed Development. The phasing of North West Cambridge means that a small scale EfW plant would only be viable once the site has been built out to provide a sufficient thermal load. Even at full build out, the size of plant required would be small in comparison to current proven technology, and less efficient than if a larger plant could be used elsewhere.

In terms of waste management, a small scale EfW plant would typically be able to treat approximately 10,000 tonnes of waste per year. The anticipated feedstock for the total development during the occupancy phase at the Proposed Development is 4,605 tonnes / year (see Table 35); therefore it is unlikely that the use of pyrolysis/gasification is viable as a waste treatment option based on site waste alone. Incinerator plants are traditionally used for the treatment of large quantities of waste (10s to low 100s of ktonnes); soimplementation of an incinerator plant is not thought to be applicable to treating waste streams from this development. Therefore these forms of EfW schemes are not considered suitable for residual waste due to the local authority 'ownership' and liability for this waste, as well as the location of an alternative existing facilities at Donarbon.

Energy from waste is currently an area in which technology is being developed, particularly for small scale systems. Therefore the Proposed Development may offer opportunities for a future EfW scheme, either as a stand-alone scheme or connected to other areas. Further discussion is provided in the Carbon Reduction Strategy submitted as part of the Planning Application alongside this document.

Code for Sustainable Homes

12 Code for Sustainable Homes

12.1 Code for Sustainable Homes (Code)

The Code for Sustainable Homes (Code) has been prepared by the Government in consultation with the Building Research Establishment (BRE) and Construction Industrial Research and Information Association (CIRIA) to act as a single national standard to guide industry in the design and construction of sustainable homes.

Three environmental issues are covered under the waste category of the Code for Sustainable Homes and these are outlined in Table 36 below. Mandatory minimum performance standards are set for some issues. Credits are not awarded for these issues. Confirmation that the performance requirements are met for all four is a minimum entry requirement for achieving a level 1 rating. Two un-credited issues are mandatory elements of Was 1 and Was 2.

The Code requirements have been mentioned in previous sections, but full detail is included here, the areas of the development that will be assessed against the Code will be;

- High density residential
- Medium density residential
- Low density residential.

Two Code credits are available for use of a SWMP for management of construction related waste and therefore the residential sections of the development will achieve the requirements as outlined in Table 36 below.

A breakdown of the available credits for waste during the construction and occupation phase is presented in Table 36 below. Storage of household waste is a mandatory requirement for the Code.

Table 36: Code Credits available for Residential Properties

Issue ID	Description	No of credits available	Criteria
Was 1	Storage of non-recyclable waste and recyclable household waste	None – mandatory element	**Storage of household waste** An *adequate external space* should be allocated for waste storage and sized to accommodate containers according to the largest of the following two volumes: · The minimum volume recommended by British Standard 5906 (British Standards Institution, 2005) based on a maximum collection frequency of once per week. This volume is 100 litres for a single bedroom dwelling, with a further 70 litres for each additional bedroom. · The total volume of the external waste containers provided by the Local Authority. Storage space must provide *inclusive access and usability* (Checklist IDP). Containers must not be stacked.
		2	**Storage of recyclable household waste** Dedicated internal storage for recyclable household waste can be credited where there is no (or insufficient) dedicated external storage capacity for recyclable material, no *Local Authority collection scheme* and where the following criteria are met: At least three internal storage bins: · all located in an *adequate internal space* • with a minimum total capacity of 60 litres.
		4	**Storage of recyclable household waste** A combination of internal storage capacity provided in an adequate internal space, with either: · a Local Authority collection scheme, or • no Local Authority collection scheme but adequate external storage capacity. **Local Authority collection scheme** In addition to a Local Authority collection scheme (with a collection frequency of at least fortnightly), at least one of the following requirements must be met: · Recyclable household waste is sorted **after** collection and a single bin of at least 30 litres is provided in an adequate internal space. · Materials are sorted **before** collection and at least three separate bins are provided with a total capacity of 30 litres. Each bin must have a capacity of at least 7 litres and be located in an

Issue ID	Description	No of credits available	Criteria
			adequate internal space. · An *automated waste collection system* which collects at least three different types of recyclable waste. **No Local Authority collection scheme but adequate external storage capacity** For houses and flats there must be at least three identifiably different internal storage bins for recyclable waste located in an adequate internal space: · with a minimum total capacity of 30 litres · with a minimum individual capacity of at least 7 litres. **AND** **For houses**, an adequate external space must be provided for storing at least three external bins for recyclable waste: · with a minimum total capacity of 180 litres · with a minimum individual capacity of 40 litres. **For flats**, a *private recycling scheme operator* must be appointed to maintain bins and collect recyclable waste regularly. Recycling containers must: · be located in an adequate external space · be sized according to the *frequency of collection*, based on guidance from the recycling scheme operator • store at least three types of recyclable waste in identifiably different bins.
Was 2	Construction Site Waste Management	1 (although a SWMP is a legal requirement)	**Minimising Construction Waste** Where there is a compliant Site Waste Management Plan (SWMP) that contains: a) Target benchmarks for resource efficiency, i.e. m3 of waste per 100 m2 or tonnes of waste per 100 m2 set in accordance with *best practice* b) Procedures and commitments to minimize non-hazardous construction waste at design stage. Specify waste minimisation actions relating to at least 3 waste groups and support them by appropriate monitoring of waste. c) Procedures for minimising hazardous waste d) Monitoring, measuring and reporting of hazardous and non-hazardous site waste production according to the defined waste groups (according to the waste streams generated by the scope of the works)
			Diverting Waste from Landfill Where there is a compliant Site Waste Management Plan (SWMP) including procedures and commitments to sort and divert waste from landfill, through either; a. Re-use on site (in situ or for new applications) b. Re-use on other sites c. Salvage/reclaim for re-use d. Return to the supplier via a 'take-back' scheme e. Recovery and recycling using an approved waste management contractor f. Compost according to the defined *waste groups* (in line with the waste streams generated by the scope of the works). **AND** One of the following has been achieved: Where at least 50% by weight or by volume of non-hazardous construction waste generated by

Issue ID	Description	No of credits available	Criteria
		2 or 3	the project has been diverted from landfill. **OR** Where at least 85% by weight or by volume of non-hazardous construction waste generated by the project has been diverted from landfill.
Was 3	Composting	1	· Individual *home composting facilities*. **OR** · A local *communal or community composting service*, which the Local Authority runs or where there is a management plan in place. **OR** · A Local Authority green/*kitchen waste collection system* (this can include an automated waste collection system). All *facilities* must also: · be in a dedicated position · provide *inclusive access and usability* (Checklist IDP) • have a supporting *information leaflet* provided to each dwelling.

12.1.1 Code Level for the Proposed Development

As a minimum the Proposed Development should aim to achieve Code Level 5 or above (apart from the first 50 units if built before 2013).

The Proposed Development should be designed to meet the maximum number of credits where technically viable. Reasons for not achieving the maximum number may be due to incompatibilities between the Code credit requirements and the selected waste collection and storage strategy. It may also be the case that certain dwellings or types of dwellings are not able to achieve every credit, for example due to location.

BREEAM

13 BREEAM

Building Research Establishment Environmental Assessment Method (BREEAM) is an environmental assessment tool used to score the environmental performance of non-residential buildings.

The BREEAM credits available for retail, industrial, office, education and multi-residential (Student halls of residence), are shown in tables below.

13.1 Construction Phase

13.1.1 WST 1: Construction Site Waste Management

Up to four BREEAM credits are available through promotion of resource efficiency via management of construction site waste.

In order for the development to comply with BREEAM Standards for Multi-Residential, Offices, Retail and Education it must meet criteria (taken from BREEAM Guidance) as presented below.

Table 37: Wst 1 – Construction Site Waste Management

<table>
<tr><th>Project Type</th><th>No. of credits available</th><th>Criteria</th></tr>
<tr><td>New Build and Major Refurbishments</td><td>3</td><td>1. Where non-hazardous construction waste generated by the building's construction phase (excluding demolition and excavation waste) meets or exceeds the following resource efficiency benchmarks.
<table>
<tr><th rowspan="2">BREEAM Credits</th><th colspan="2">Amount of waste generated per 100m^2 (gross internal floor area)</th></tr>
<tr><th>m^3</th><th>tonnes</th></tr>
<tr><td>One credit</td><td>13.0 - 16.6</td><td>6.6 - 8.5</td></tr>
<tr><td>Two credits</td><td>9.2 - 12.9</td><td>4.7 - 6.5</td></tr>
<tr><td>Three credits</td><td><9.2</td><td><4.7</td></tr>
</table>
*Volume (m^3) is actual volume of waste (not bulk volume)

2. Where there is a SWMP that contains:
- The target benchmark for resource efficiency i.e. m^3 of waste per 100m^2 or tonnes of waste per 100m^2;
- Procedures and commitments for minimising non-hazardous waste in line with the benchmark;
- Procedures for minimising hazardous waste;
- Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;
- Procedures for sorting, reusing, and recycling construction waste into defined waste groups, either on site or through external contractor;
- The name and job title of the individual responsible for implementing the above.</td></tr>
</table>

Project Type	No. of credits available	Criteria
Demolition and refurbishment projects	1	1. In addition to the above, sites with existing buildings that will be refurbished or demolished, where demolition forms part of the principal contractor's works contract, must comply with the following: - Completed a pre-demolition/pre-refurbishment audit of the existing building to determine if, in the case of demolition, refurbishment is feasible and, if not, to maximise the recovery of material from demolition or refurbishment for subsequent high-grade/value applications. The audit must be referenced in the SWMP and cover: I. Identification of the key refurbishment/demolition materials; II. Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials.
New Build and Major Refurbishment	1	1. Where at least 75% by weight or 65% by volume of non-hazardous construction waste generated by the project has been diverted from landfill and either: a) Reused on site (in-situ or for new applications); b) Reused on other sites; c) Salvaged/reclaimed for reuse; d) Returned to the supplier via a 'take-back' scheme; e) Recovered from site by an approved waste management contractor and recycled. 2. For demolition projects, in addition to the above requirement for construction-related waste, 90% by weight or 80% by volume of non-hazardous demolition waste has been diverted from landfill; 3. Where there is a Site Waste Management Plan complying with the above criteria; 4. Waste materials will be sorted into separate key waste groups (according to the waste streams generated by the scope of the works) either onsite or offsite through a licensed contractor for recovery.
Exemplary	1 Innovation credit	The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue. 1. Where non-hazardous construction waste generated by the building's development meets or exceeds the resource efficiency benchmark required to achieve three credits (as outlined above); 2. Where at least 90% by weight (80% by volume) of non-hazardous construction waste and 95% of demolition waste by weight (85% by volume) (if applicable) generated by the build has been diverted from landfill and either: a) Reused on site (in-situ or for new applications); b) Reused on other sites; c) Salvaged/reclaimed for reuse; d) Returned to the supplier via a 'take-back' scheme; e) Recovered from site by an approved waste management contractor and

Project Type	No. of credits available	Criteria
		recycled. 3. All key waste groups are identified for diversion from landfill at pre-construction stage SWMP.

13.1.2 Wst 2: Recycled Aggregates

One Credit is available for the use of secondary aggregate in the construction process providing:

1. The amount of recycled and secondary aggregate specified is over 25% (by weight or volume) of the total *high-grade* aggregate uses for the building. Such aggregates can be **EITHER:**

a. Obtained on site **OR;**
b. Obtained from waste processing site(s) within a 30km radius of the site; the source will be principally from construction, demolition and excavation waste (CD&E) – this includes road planings **OR;**
c. Secondary aggregates obtained from a non-construction post-consumer or post-industrial by-product source (see Table 38).

Table 38: BREEAM Wst 2 Compliance Notes

New Build	There are no additional or different requirements to those outlined above specific to new-build projects.
Refurbishment	This credit available for this issue can be awarded automatically where no new aggregate is being used. Potentially the case in most refurbishments.
Extensions to existing buildings	There are no additional or different requirements to those outlined above specific to the assessment of extensions to existing buildings.
Shell Only (Retail and Office only)	There are no additional or different criteria to those outlined above specific to shell-only assessments.
Fit Out Only (Retail and Office only)	Issue not applicable for Fit-Out-only assessments.
Secondary Aggregates	Recognised non-construction post consumer or post-industrial by-products include: - China clay waste - Slate overburden - Pulverised Fuel Ash (PFA) - Ground Granulated Blast Furnace Slag (GGBFS) - Air-cooled blast furnace slag - Steel slag - Furnace bottom ash (FBA) - Incinerator bottom ash - Foundry sands - Recycled glass - Recycled plastic - Tyres - Spent oil shale - Colliery spoil - Municipal Solid Waste Treatment Residues

13.2 Occupation Phase

Credits are available during the occupation phase dependent upon the building type as outlined below.

13.2.1 BREEAM Multi-residential

BREEAM Multi-residential is a tool that can be used to assess student halls of residence for the development. The following credits will be gained in addition to those outlined in Section 13.1 above.

Table 39: BREEAM Multi-Residential Credits available

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
Multi-residential	Wst 3 – Recyclable Waste Storage	1 or 2	**First credit**: 1. Provision of three internal storage bins within each self contained dwelling/bedsit with the following characteristics: a. A minimum total capacity of 30 litres b. No individual bins smaller than 7 litres c. All bins in a *dedicated non obstructive position* d. These three bins for recyclable materials should be provided in addition to the normal non-recyclable waste bins 2. For buildings consisting of individual bedrooms and communal facilities, the first credit can be achieved where the above storage size requirements are met for every six bedrooms. The recycled storage can be located in a *dedicated non obstructive position* in either: a. Communal kitchens or, b. Where there are no communal kitchens present, they can be located in communal spaces such as communal lounges or utility areas. **Second credit:** 1. A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following: a. Clearly labelled for recycling b. Placed within accessible reach of the building (see compliance notes) c. In a location with good vehicular access to facilitate collections. 2. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum: a. At least $2m^2$ per $1000m^2$ of net floor area for buildings $<5000m^2$ b. A minimum of $10m^2$ for buildings $\geq 5000\ m^2$ c. An additional $2m^2$ per $1000m^2$ of net floor area where catering is provided (up to an additional minimum of $10m^2$ $\geq 5000m^2$).
	Wst 4 – Compactor / Baler	N/A	This issue is not assessed under this scheme.
	Wst 5 - Composting	1	The following demonstrates compliance: 1. Individual dwellings/communal kitchens are provided with home composting facilities with a home composting information leaflet that is provided in each individual dwelling/communal kitchen AND 2. A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use and is accessible to residents. 3. There is adequate space for storing segregated food waste and composted organic material. 4. At least one water outlet is provided for cleaning in and around the facility.

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
			OR 5. Where there are space or access limitations on site, the following demonstrates compliance: a. There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility. b. At least one water outlet is provided for cleaning in and around the facility.

13.2.2 BREEAM Retail

The development should aim to achieve all three BREEAM Retail credits for the occupancy phase in addition to those outlined in Section 13.1 above. The requirements for BREEAM are outlined in Table 40 below:

Table 40: BREEAM Retail Credits available

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
Retail	Wst 3 – Recyclable Waste Storage	1	1. A dedicated storage space to cater for the volume of recyclable materials generated by the retailer(s) during operation. 2. The dedicated space must cater for the separation and storage of a minimum of 6 different types of recyclable materials, these may include: · Paper · Cardboard · Plastics (including packaging film) · Other packaging materials (not covered above) · Glass (segregated into brown, green and clear glass) · Metals · Batteries · Timber · Fluorescent lamps · Vegetable oils · Mineral oils · Food waste Note: For assessments of building/units for service providers please refer to the Compliance Notes. 3. The dedicated space is: a. Clearly labelled for recycling b. Placed within accessible reach of the building c. Sized according to the number and area of retail units that it will serve and the predicted volumes of waste that will arise from those areas d. In a location with good vehicular access to facilitate collections.
	Wst 4 – Compactor / Baler	1	1. A static waste compactor or baler is installed and situated in a service area or dedicated waste management space. 2. At least one water outlet is provided for each waste sorting and/or storing facility. 3. The recyclable waste storage criteria of BREEAM issue WST 3 have been met.
	Wst 5 - Composting	1	The following demonstrates compliance: 1. A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use.

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
			2. There is adequate space for storing segregated food waste and composted organic material. 3. At least one water outlet is provided for cleaning in and around the facility. OR 4. Where there are space or access limitations on site, the following demonstrates compliance: a. There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility. b. At least one water outlet is provided for cleaning in and around the facility.

13.2.3 BREEAM Office

The development should aim to achieve the one BREEAM Office credit for the occupancy phase in addition to those outlined in Section 13.1 above. The requirements for BREEAM are outlined in Table 41 below:

Table 41: BREEAM Office credits available

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
Office	Wst 3 – Recyclable Waste Storage	1	1. A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following: a. Clearly labelled for recycling b. Placed within accessible reach of the building (see Compliance Notes) c. In a location with good vehicular access to facilitate collections. 2. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum: a. At least $2m^2$ per $1000m^2$ of net floor area for buildings $<5000m^2$ b. A minimum of $10m^2$ for buildings $\geq 5000\ m^2$ c. An additional $2m^2$ per $1000m^2$ of net floor area where
	Wst 4 – Compactor / Baler	N/A	Not assessed under this scheme.
	Wst 5 – Composting	N/A	Not assessed under this scheme.
	Wst 6 – Floor Finishes	1	The following Demonstrates Compliance: 1. For tenanted areas (where the future occupant is not known), prior to full fit-out works, carpets and floor finishes have been installed in a show area only. 2. In a building developed for a specific occupant, that occupant has selected (or agreed to) the specific floor finishes.

13.2.4 BREEAM Education

The development should aim to achieve all three BREEAM Education credits for the occupancy phase in addition to those outlined in Section 13.2 above. The requirements for BREEAM are outlined in Table 42 below.

Table 42: BREEAM Education credits available

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
Education	Wst 3 – Recyclable Waste Storage	1 or 2	**First credit (all educational building types)** 1. A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following: a. Clearly labelled for recycling b. Placed within accessible reach of the building (see Compliance Notes) c. In a location with good vehicular access to facilitate collections. 2. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum: a. At least $2m^2$ per $1000m^2$ of net floor area for buildings $<5000m^2$ b. A minimum of $10m^2$ for buildings $\geq 5000\ m^2$ c. An additional $2m^2$ per $1000m^2$ of net floor area where catering is provided (with an additional minimum of 10m2 for buildings $\geq 5000m^2$). **Schools & sixth form only - Second credit** 3. There is a school recycling policy and an outline of the procedures that are in operation or that will be in place when the building is complete. As a minimum, the policy should cover: a. Paper and magazines, cardboard, plastics, metals, printer & toner cartridges b. Where composting facilities are provided, the policy must also cover the collection of the compost unless the compost can be used on site
	Wst 4 – Compactor / Baler	1	**For Higher Education buildings only** 1. A static waste compactor or baler is installed and situated in a service area or dedicated waste management space. 2. At least one water outlet is provided for each waste sorting and/or storing facility. 3. The recyclable waste storage criteria of BREEAM issue WST 3 have been met.
	Wst 5 – Composting	1	**For Higher Education buildings only** 1. A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use. 2. There is adequate space for storing segregated food waste and composted organic material. 3. At least one water outlet is provided for cleaning in and around the facility. OR 4. Where there are space or access limitations on site, the following demonstrates compliance:

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
			a. There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility. b At least one water outlet is provided for cleaning in and around the facility.

13.2.5 BREEAM Industrial

The development should aim to achieve all two BREEAM Industrial credits for the occupancy phase in addition to those outlined in Section 13.2 above. The requirements for BREEAM are outlined in Table 43 below.

Table 43: BREEAM Industrial credits available

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
Industrial	Wst 3 – Recyclable Waste Storage	1	The following demonstrates compliance: 1. A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following: a. Clearly labelled for recycling b. Placed within accessible reach of the building (see Compliance Notes) c. In a location with good vehicular access to facilitate collections. 2. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum: For the assessment of units with an unknown end occupier, i.e. speculative units: a. The space provided should allow a hard standing area for at least one standard 8 cubic yard skip (for units with an operational area of<1000m^2) and two standard 8 cubic yard skips (for units with an operational area $\geq$1000m^2) **PLUS** b. At least 2m^2 per 1000m^2 of net office floor area. For the assessment of units where the occupier is known, i.e. fitted out units: a. The space provided should allow a hard standing area that is adequate to enable the occupier to recycle materials from the operational area(s) effectively **PLUS** b. At least 2m^2 per 1000m^2 of net office floor area for buildings <5000m^2; a minimum if 10m^2 for buildings $\geq$5000m^2 c. The dedicated space must cater for the separation and storage of the following types of recyclable materials (where generated by the end user): - Paper - Cardboard - Glass - Plastics - Packaging - Metals

Type of BREEAM	Issue Title	Credits available	Assessment Criteria
			- Timber - Other process related recyclable waste. The space for storage of recyclable materials from the office and operational areas does not necessarily have to be a combined space. This is of particular importance for larger buildings where a combined storage area may result in that area not meeting the requirement for accessibility from either the office or operational building areas.
	Wst 4 – Compactor / Baler	1	The following demonstrates compliance: 1. A static waste compactor or baler is installed and situated in a service area or dedicated waste management space. 2. At least one water outlet is provided for each waste sorting and/or storing facility. The recyclable waste storage criteria of BREEAM issue WST 3 have been met.

13.3 Summary - Achieving BREEAM Excellent

This section provides a discussion of the BREEAM requirement for the applicable schemes and the design implications for the Proposed Development. Achieving BREEAM Excellent will be challenging and there will be a number of credits in other sections of BREEAM which cannot be gained due to aspects beyond the control of the design, such as location. Therefore it is important that the Proposed Development targets all credits which are achievable, including all of the viable waste credits.

It is proposed that all of the buildings subject to a BREEAM rating will target the maximum number of credits in the waste category where viable. The requirements for BREEAM will change under future revisions of the scheme and the viability of these targets will need to be reviewed for each revision.

Sustainable Resource and Waste Management Strategy

14 Sustainable Resource and Waste Management Strategy

14.1 Summary

This report examines the drivers for meeting sustainable waste management, and assesses a range of options which can be used to help achieve the requirements. Based on the analysis, the strategy for the management of waste at the Proposed Development is:

- Careful monitoring and reduction of waste generation from the construction process to minimise landfill, and maximise recycling.
- Materials selection will consider the availability of re-usable materials, recycled content, recyclability, lifetime, and embodied CO_2. The final selection will be made based on an assessment of these metrics alongside other requirements.
- Transfer of materials to or from the site as a result of ground works to be reduced as much as practicable (i.e. cut and fill balance). Suitable materials generated on site will be used for landscaping purposes to minimise transfer.
- Communal waste collection systems on most or all of the site to reduce the impact of separate wheelie bins.
- Composting for landscape maintenance waste, allotment waste, and food waste from the food store, school and other on-site catering. Compost to be used on allotments and the landscaping.
- Individual compost bins provided to private gardens and communal gardens.
- Separate bins for different waste streams to allow source segregation within dwellings to make separation simple.
- Requirements for commercial organisations to follow the site waste strategy through lease arrangements.

This is outlined further below.

14.2 Construction Phase Waste strategy

A robust SWMP and the Construction and Environment Management Plan will commit the project to sustainability through appropriate management of the excavation, demolition and construction phase. Challenging waste minimisation and landfill diversion targets will be set via Development Briefs with the aim of reducing the waste arisings to **less than circa 21,000 m^3** (this figure is indicative of the current waste generation estimates and is subject to change). This is around an 80% reduction from typical practice.

This will be achieved through:

- The design team reducing waste through use of appropriate material specification, construction methodologies and by balancing any necessary cut and fill;
- Segregation and phasing ‘best practice’ should be utilised during demolition and construction phases to ensure BREEAM and Code credits are achieved;
- Waste treatment on and off-site should be considered – mobile treatment of large volumes of recyclable aggregate could be utilised, however smaller volumes would be better treated at an off-site facility.

Additionally, landfill diversion targets of 90% (by weight) for non-hazardous construction waste and 95% for non-hazardous demolition waste (by weight) will be considered for inclusion in the Development Briefs in line with the BREEAM Innovation Credit available during the construction phase.

14.3 Occupancy Phase Waste Strategy

During the occupancy phase of the development it has been estimated that **6,091 tonnes** of waste per annum will be produced with Residential (4,295 tonnes), Student Housing (1,000 tonnes) and Academic / Commercial Research (414 tonnes) producing the majority of this waste (these figures are indicative of the current waste generation estimates and are subject to change). The stakeholders responsible for the waste streams are:

- Residential development (potentially including Student Housing) – Local Authority (likely to be Cambridge City Council);
- Public Open Space – University of Cambridge;
- Commercial / Industrial waste – Producer.

14.3.1 Detailed Planning

When undertaking the detailed planning stage of the development it is likely to be necessary to complete and submit the RECAP Waste Management Design Toolkit including:

- Design Standards Checklist (refer to Appendix A)
- Assessment Criteria (refer to Appendix B)
- Basis for conditions and agreements (refer to Appendix C)

14.3.2 Waste Treatment

Houses with gardens will be provided with a suitable compost bin. This is not a requirement of the Code as the WCA collects segregated organic waste, but by including their provision aids the development of a sustainable waste awareness for residents and provides a practical and useful means of treating waste on-site.

It is intended that biodegradable waste from any catering facilities, gardens and landscape waste, will be retained on site for composting using an in-vessel composting system. This compost will be made available free of charge to residents to use on gardens and allotments, and for maintaining the site landscape. The system will have an operation contract to ensure it operates successfully.

For other non-University owned commercial/industrial units either individual in-vessel composters will be provided to treat food waste, or if there is insufficient space; a suitably equipped designated area will be provided to store food waste for treatment elsewhere (potentially the University facility).

Due to pre-existing municipal waste contracts, and technical viability, a large scale waste treatment technology is not feasible.

14.3.3 Waste Storage

Waste storage capacity will generally be provided in line with the RECAP guide, and checked against the RECAP waste management design guide toolkit. The exception will be external waste storage where for single households a requirement for 720 litres capacity will be sufficient rather than the stated 775 litres – this is in line with the WCA's current systems, and has been agreed in the consultation process.

For non-residential buildings (including student accommodation) storage capacities and requirements shall be in line with the Wst 3 requirements of the relevant BREEAM scheme.

Choice of storage receptacles will be subject to further consultation with the regulatory authority. The current preferred option is to provide all residential areas with communal deep underground storage bins. The options appraisal revealed this to be the best option for high and medium density areas, but not for low density areas. However, it is considered that the use of a single waste storage strategy for the whole development will provide economies of scale, and engender a positive waste culture with the residents. All residential properties will be provided with ability to segregate materials into three separate receptacles and have a travel distance of no more than 30m from the property to the waste collection point where viable. This option has been discussed in with the Waste Task Group and has been subject to technical and economic modelling to ensure that it is sound for the site.

14.4 Environmental Assessment Methodologies

14.4.1 Code for Sustainable Homes

As a minimum, all homes on the development are to achieve Code Level 5 or above (except for the first 50 homes if built before 2013 which have an exemption in the AAP). To this aim all six waste credits will be achieved where technically feasible.

14.4.2 BREEAM

All non domestic buildings will aim to meet BREEAM Excellent and as such all BREEAM credits for waste will be achieved where technically feasible.

Implications for the Development

15 Implications for the Proposed Development

15.1 Waste Treatment

A feasibility study into the use of waste treatment technologies was undertaken. This study found that due to limited predicted waste streams energy from waste and thermal treatment technologies were not appropriate for the development. However use of an in-vessel composter for feedstock provided by the landscape maintenance, allotments, food waste from the food store and on-site catering waste is suitable for the development and suitable provision may need to be allocated for this.

Based on all the anticipated suitable commercial and green waste being sent to this facility (216 t/yr) a covered area of hardstanding would be required to house an in-vessel composter. Example dimensions for a system of this size are 6.0m(l)×1.2m(w)×1.8m(h) based on manufacturers data.

15.2 External Waste Storage

The strategy suggests that deep underground communal bins might be utilised over the entire Application Site where technically and economically viable. This includes all residential areas.

The Building Regulations, Code and RECAP Guide all require that the Proposed Development provides external waste storage which is within of 30m from residences (the Code and RECAP provide a small amount of flexibility, but Building Regulations are less flexible and so 30m is seen as a requirement). The Code for Sustainable Homes allows this distance to be increased to 50m "where strategic reasons outside the control of the developer make it impossible to meet this requirement....a written justification must be provided to the Code Service Provider (Assessor)".

If communal underground bins are to be used in low, medium and high density areas then the future design proposals will need to allocate space for this infrastructure within the streets. In addition it should be noted that in order to comply with the resident transit requirements some over sizing of communal underground bins may be required in low density housing areas.

An indicative footprint of each bin compound (including 3 bins) would be 6m×2m.

Refuse vehicles will be required to travel within 15m of storage points for two wheeled containers and within 10m for storage points for four wheeled containers. Due to the 30m resident transport requirement, turning heads will be required at the end of cul- de-sacs with a length of greater than 45m.

15.3 Deep Bin Collection

The deep bin collection system requires ability for the collection vehicle to pull up adjacent to the bin compound to allow the hydraulic arm to lift the bin from its concrete casing.

A typical waste collection vehicle has the following indicative specifications:

- 26 tonnes gross vehicle weight (GVW);
- Length of 11m;
- Width of 2.4m;
- Operating height of 4m; and
- Wall to wall turning circle of 21.9m.

There needs to be enough clear space around the vehicle to allow efficient operation. For example, a minimum working area of 3.5m width and 4m in length should be sufficient where the emptying of containers takes place.

While BS5906: 2005 requires a minimum of 5 metres street width for waste vehicles, there may be instances where a lesser width may be appropriate providing vehicle tracking is undertaken and it can be demonstrated to the satisfaction of the WCA that the waste collection vehicle to be employed can pass through narrower street widths. Where a development is to be served by a Local Authority waste collection service this means being capable of accommodating a vehicle with the typical dimensions described above.

The appropriateness for function of carriageway width must be checked by plotting vehicle tracking paths. BS5906: 2005 states that routes should permit collection vehicles to continue mainly in a forward direction and should not require vehicles to reverse more than 12m. Where this distance is exceeded turning heads must be provided in accordance with the principles of vehicle tracking.

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Appendices

Appendix A

RECAP Waste Management Design Guide Toolkit – Design Standards Checklist

This will be completed during the detailed/reserved matters planning applications for each of the phases.

Key Consideration	STEP 1		STEP 2
	Aware Of Standard Minimum Expectations?	Does This Apply to You? ✔ or ✘	Submit Proposals To Planning Authority (Provide Plan/document Reference)
Residential -Internal Storage Requirement Refer to Part 4.2 of the Design Guide.	35 – 40 litres for single dwellings and multi-occupancy developments (low-rise and high-rise) permitting segregation of waste as appropriate. Typical container specifications are detailed at Appendix A.	✔	
Residential -External Storage Requirement Refer to Part 4.2 of the Design Guide.	Single Dwelling - Space for containers allowing 775 litres of capacity must be provided. Typical container specifications are detailed at Appendix A. Provision of containers and/or financial contributions towards may also be required.	✔	
	Low-rise with communal gardens - Space for containers allowing between 320 and 720 litres of capacity per unit (depending on room number) must be provided. Typical container specifications are detailed at Appendix A. Provision of containers and/or financial contributions towards may also be required.	✔	
	Low-rise without communal gardens - Space for containers allowing between 240 and 640 litres of capacity per unit (depending on room number) must be provided. Typical container specifications are detailed at Appendix A. Provision of containers and/or financial contributions towards may also be required.	✔	
	High-rise - Space for containers allowing between 240 and 640 litres of capacity per unit (depending on room number) must be provided. Typical container specifications are detailed at Appendix A. Provision of containers and/or financial contributions towards may also be required.	✔	
Commercial - Storage Requirements Refer to Part 4.3 of the Design Guide.	Offices - 2600 litres per 1000m gross floor area. Typical container specifications detailed at Appendix A.	✔	
	Retail - 5000 litres per 1000m gross floor area. Typical container specifications detailed at Appendix A.	✔	
	Restaurants/Fast Food Outlets - 1500 litres per 20 dining spaces. Typical container specifications detailed at Appendix A.	✔	
	Hotels - 5000 litres per 20 dining spaces. Typical container specifications detailed at Appendix A.	✔	
Waste Storage Point - Single Houses Refer to Part 5.3 of the Design Guide.	• Waste should not have to be moved more than 30m to storage area; • Storage location should not be more than 30m distance from the collection point; collection crews should not have to carry individual waste containers or move 2-wheel containers more than 25m. • Passage of a 240l wheelie-bin from store to collection	✔	

	point should avoid steps, but where not possible should avoid transfer over more than 3 steps. • Gradients over which containers must traverse should not exceed 1:12. • Not have to be moved through a building to the collection point.		
Waste Storage Point – Flats and Apartments and Commercial Developments Refer to Parts 5.3 and 5.4 of the Design Guide.	• Waste should not have to be moved more than 30m (excluding vertical distance) to storage area; • Storage location should not be more than 10m distance from the collection point; • Passage of waste containers from store to collection point should avoid steps, but where not possible should avoid transfer over more than 3 steps. • Gradients over which containers must traverse should not exceed 1:12	✔	
Waste Storage Infrastructure Refer to Part 6 of the Design Guide.	Where infrastructure is installed for the communal storage of waste a SIMPLE assessment of the location and proposed infrastructure must be made against the key factors as specified in the accompanying Assessment Criteria. The size of any storage area should be capable of accommodating the required number of waste receptacles (and their associated dimensions) or provide adequate capacity. General design features for above-ground storage compounds: • Sufficient clearance provided to allow full opening of the container lid; • 150mm clear space between and around containers; • Minimum working headroom of at least 2m (where compound is covered); and • Layout such that any one receptacle can be serviced without having to move any other receptacle. Specific design requirements are detailed at Appendix D and should be referred to. Underground storage systems require: • Area(s) of ground free from services; and • Sufficient clear space above and around to allow emptying of containers. An indicative generic specification of an underground Bring Site facility is attached as Appendix G.	✔	
Highways Refer to Part 7.4 of the Design Guide.	Where development proposals will seek to utilise a standard service as provided by the Waste Collection Authority, highways should: • Have a minimum width of 5m; • Permit collection vehicles to continue mainly in a forward direction; • Not require vehicles to reverse more than 12m; • Be constructed in accordance with relevant guidance; and • Allow at least 4m vertical clearance. In addition a minimum working area of 3.5m width and 4m in length	✔	

	should be allowed where the emptying of containers takes place. Sufficient overhead clearance should also be provided to allow for operation.		
Household Recycling Centre Requirement Refer to Part 8.4 of the Design Guide.	Where appropriate, developers will be expected to: • Provide finance for upgrading existing Household Recycling Centres; or • Provide finance for new Household Recycling Centres; and/or • Make land available for strategically located Household Recycling Centres Section 106 Agreements or other suitable legal agreements, will be used to secure contributions/land and ensure that adequate provision is made.	✔	
Bring Site Requirement Refer to Part 9.3 and 9.4 of the Design Guide.	To ensure provision of 1 bring site per 800 households, developers will be required to: • Provide finance and/or provision of infrastructure for new sites; or • Provide finance for upgrading existing facilities. Residential developers will be minimally required to provide temporary on-site facilities by occupation of the 50th property. Both temporary and permanent Bring Site facilities should be located at least 20m distance from the nearest property, accessible by service vehicles and located so as to avoid damage to overhead services during servicing. Section 106 Agreements or other suitable legal agreements, will be used to secure contributions and ensure that adequate provision is made. A SIMPLE assessment of the location and proposed infrastructure must be made against the key factors as specified in the accompanying Assessment Criteria. In Peterborough, contributions to related off-site provision for development will be consistent with the Planning Obligations Implementation Scheme.	✔	
Alternative Waste Management Schemes Refer to Part 1.4 of the Design Guide.	A DETAILED assessment of the scheme must be made against the key factors as specified in the accompanying Assessment Criteria. A developer will be required to fund such schemes beyond the amount the Local Authority would otherwise pay for standard service and pay for and provide non-standard infrastructure.	✔	

Appendix B

RECAP Waste Management Design Guide Toolkit – Assessment Criteria

These will be completed appropriately at the detailed/reserved matters planning application stage for each phase.

SHEET A: WASTE STORAGE COMPOUND

Assessment Factor	Information Required – Simple Assessment	Submit Assessment to Planning Authority (Provide Document Reference)
Quality Place Making	Design should also be assessed for consistency with the wider development framework and the promotion of quality place making.	
Proposals for On-site Treatment	On-site treatment (e.g. bailing, compaction or other treatment that may be utilised in an alternative scheme) may be beneficial on larger sites. In such cases, a clear illustration must be provided of (where appropriate): • Sustainability of treatment methods; • Waste volume reduction; • Beneficial use of waste (recovery of value, energy, etc); • Implications for Waste Collection Authority and Waste Disposal Authority.	
Accessibility	Depending upon the waste infrastructure employed, it must be demonstrated that: • The location chosen offers convenience and efficiency for all users; • An assessment of potential user conflict has been made with appropriate solutions provided; and • Marking and signage is adequate for function.	
Health and Safety	All proposals must be accompanied by a health and safety risk assessment and account must be made of (where appropriate): • Lighting; • Steps and gradients; • Marking and signage; • User conflicts; • Risks from equipment/technology utilised; • Training requirements (operators);	
Security	It must be clearly demonstrated that proposals: • Will not jeopardise the security of the wider area; and • Infrastructure will, as appropriate, feature security measures that permit efficient user operation but are robust enough to deter vandalism, arson and other forms of misuse. Notes on waste compound security are presented at Appendix E.	
Protection of the Environment	Assessment must be made of the impact proposals may have in terms of: • Nuisance and amenity (including visual impact); and • Pollution threat to environmental media (i.e. air, land and water). • Damage and disturbance to nationally and internationally protected sites and wider biodiversity. Suitable mitigation measures must be outlined.	
Maintenance	Where maintenance responsibility lies with the developer they must:	

	• Submit proposed maintenance schedules (routine and non-routine); • Submit proposals for maintaining records of works undertaken; and • Submit details of third party contractors to be employed.	

For multiple storage points/methods, this table should be copied and completed as appropriate.

SHEET B: PROVISION OF BRING SITE INFRASTRUCTURE

Assessment Factor	Information Required – Simple Assessment	Discussed With Local Authority? ✔ or ✘	Submit Assessment to Planning Authority (Provide Document Reference)
Quality Place Making	Design should also be assessed for consistency with the wider development framework and the promotion of quality place making.		
Proposals for On-site Treatment	On-site treatment (e.g. bailing, compaction or other treatment that may be utilised in an alternative scheme) may be beneficial on larger sites. In such cases, a clear illustration must be provided of (where appropriate): • Sustainability of treatment methods; • Waste volume reduction; • Beneficial use of waste (recovery of value, energy, etc); • Implications for Waste Collection Authority and Waste Disposal Authority.		
Accessibility	Depending upon the waste infrastructure employed, it must be demonstrated that: • The location chosen offers convenience and efficiency for all users; • An assessment of potential user conflict has been made with appropriate solutions provided; and • Marking and signage is adequate for function.	✔	
Health and Safety	All proposals must be accompanied by a health and safety risk assessment and account must be made of (where appropriate): • Lighting; • Steps and gradients; • Marking and signage; • User conflicts; • Risks from equipment/technology utilised; • Training requirements (operators);	✔	
Security	It must be clearly demonstrated that proposals: • Will not jeopardise the security of the wider area; and • Infrastructure will, as appropriate, feature security measures that permit efficient user operation but are robust enough to deter vandalism, arson and other forms of misuse.		

	Notes on waste compound security are presented at Appendix E.		
Protection of the Environment	Assessment must be made of the impact proposals may have in terms of: • Nuisance and amenity (including visual impact); and • Pollution threat to environmental media (i.e. air, land and water). Suitable mitigation measures must be outlined. • Damage and disturbance to nationally and internationally protected sites and wider biodiversity.		
Maintenance	Where maintenance responsibility lies with the developer they must: • Submit proposed maintenance schedules (routine and non-routine); • Submit proposals for maintaining records of works undertaken; and • Submit details of third party contractors to be employed.		

For multiple storage points/methods, this table should be copied and completed as appropriate.

SHEET C: ALTERNATIVE SCHEMES

Assessment Factor	Information Required – Detailed Assessment	Consult Local Authority? ✔	Submit Assessment to Planning Authority (Provide Document Reference)
Development Density and Scale	A developer must demonstrate that their proposals: • Will adequately serve the population density of their development and, if applicable, the wider population; • Allocate sufficient land to allow their proposals to function efficiently; • Provide sufficient capacity to account for anticipated density changes in the short-term.	✔	
Infrastructure Design	It must be demonstrated that infrastructure employed: • Is adequate to execute function; • Is robust and durable; • Is compliant with all relevant standards; and • Avoids unnecessary complexity.	✔	
Quality Place Making	Design should also be assessed for consistency with the wider development framework and the promotion of quality place making.	✔	
Proposals for On-site Treatment	On-site treatment (e.g. bailing, compaction or other treatment that may be utilised in an alternative scheme) may be beneficial on larger sites. In such cases, a clear illustration must be provided of (where appropriate): • Sustainability of treatment methods; • Waste volume reduction; • Beneficial use of waste (recovery of value, energy, etc); • Implications for Waste Collection Authority and Waste	✔	

	Disposal Authority.		
Accessibility	Depending upon the waste infrastructure employed, it must be demonstrated that: • The location chosen offers convenience and efficiency for all users; • An assessment of potential user conflict has been made with appropriate solutions provided; and • Marking and signage is adequate for function.	✔	
Health and Safety	All proposals must be accompanied by a health and safety risk assessment and account must be made of (where appropriate): • Lighting; • Steps and gradients; • Marking and signage; • User conflicts; • Risks from equipment/technology utilised; • Training requirements (operators);	✔	
Security	It must be clearly demonstrated that proposals: • Will not jeopardise the security of the wider area; and • Infrastructure will, as appropriate, feature security measures that permit efficient user operation but are robust enough to deter vandalism, arson and other forms of misuse.	✔	
Protection of the Environment	Assessment must be made of the impact proposals may have in terms of: • Nuisance and amenity (including visual impact); and • Pollution threat to environmental media (i.e. air, land and water). Suitable mitigation measures must be outlined. • Damage and disturbance to nationally and internationally protected sites and wider biodiversity.	✔	
Maintenance	Where maintenance responsibility lies with the developer they must: • Submit proposed maintenance schedules (routine and non-routine); • Submit proposals for maintaining records of works undertaken; and • Submit details of third party contractors to be employed.	✔	

Where alternative schemes are proposed, this table should be copied and completed as appropriate.

Appendix C

RECAP Waste Management Design Guide Toolkit – Basis for Conditions and Agreements

Purpose
To be used by the Local Planning Authority when assessing initial design proposals as submitted by the developer.
It may be appropriate to apply conditions or reach agreement on several factors in relation to the development and this tool is a platform for negotiating suitable solutions to arrangements for:

- Financial Contributions;
- Infrastructure and Land Provision;
- Location Issues; and
- Infrastructure ownership and maintenance.

In Peterborough the basis for conditions and/or agreement should be applied in conjunction with the Peterborough Planning Obligations Scheme.

Informing the Developer
Any conditions should be imposed or an agreement negotiated in accordance with standard planning procedures and mechanisms.

BASIS FOR CONDITIONS AND/OR AGREEMENTS

Factor	Basis For Condition or Agreement	Applicable to?
Waste Storage containers (Paragraphs 4.4 and 4.18 of the Design Guide)		
Finance and/or Infrastructure	Finance will be provided by the developer sufficient to allow for the provision of appropriate waste storage containers by the local authority.	All new developments within Cambridgeshire and Peterborough with a residential element.
	Provision of appropriate waste storage containers shall be made by the developer sufficient to meet the needs of the development.	
Household Recycling Centres (Paragraph 8.7 of the Design Guide)		
Finance	Finance will be provided by the developer sufficient to allow the upgrade of existing facilities or the creation of new facilities.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of existing Household Recycling Centres.
Land	An area of land/areas of land the will be provided by the developer (at no cost to the Local Planning Authority or Waste Planning Authority) sufficient in size to allow the creation of new facilities at strategic locations.	
Bring sites (paragraphs 9.5 and 9.9 of the Design Guide)		

Finance	Finance will be provided by the developer sufficient to allow the upgrade of existing facilities or the creation of new facilities.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.
Infrastructure	Infrastructure suitable for the creation of both temporary and permanent Bring Sites (as appropriate) will be provided by and installed by the developer. In the case of temporary facilities, the developer shall also be responsible for removal of infrastructure at the appropriate time and then developing the land in a manner that is either consistent with its wider development as agreed with the Local Planning Authority or in accordance with Local Planning Authority specifications.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.
Land	An area of land/areas of land the will be provided by the developer (at no cost to the Local Planning Authority or Waste Planning Authority) sufficient in size to allow the creation of new facilities.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.
Location*	Suitable locations shall be provided for the provision of both temporary and/or permanent Bring Sites so as to be easily and conveniently accessible to site users and service vehicles. Such locations shall be identified in consultation with the Local Planning Authority.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.
Ownership	Land and infrastructure ownership shall be retained by the developer until such time as the developer has demonstrated to the satisfaction of the Local Planning Authority that adequate arrangements governing future ownership are in place.	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.
Management & Maintenance	The developer should make adequate arrangements for the management and maintenance of	All new developments within Cambridgeshire with a residential element or consistent with the requirements of the Peterborough City Planning Obligations Implementation

	all temporary facilities. The developer should demonstrate to the satisfaction of the Local Planning Authority that adequate arrangements are in place for the future management and maintenance of all permanent facilities.	Scheme. Type of contribution to be based (in part) upon assessment of impact upon existing Bring Sites.

*The location of a Recycling Centre must meet the needs of the Mineral and Waste Local Development Framework and Waste Disposal Authority.

Appendix D

Collection Options Scoring System

Assessment Criteria	Score *	
Proven technology/waste management method	5	Technology/waste management method is proven and common in the UK.
	3	Technology/waste management method is used in the UK market, and is known to be proven abroad.
	1	Technology/waste management method is untested in the UK/ Internationally.
Avoidance of visual intrusion	5	Receptacles completely hidden with only the access points visible
	3	Receptacles are hidden in a visible waste management compound
	1	Receptacles are fully visible and visually intrusive
Ability to apply in a phased approach	5	System is not affected by economies of scale meaning it is as efficient following construction of the first phase as it is following the last.
	3	System would allow phased approach, but economies of scale mean that the system is more efficient following completion of the project than it is at the beginning.
	1	System is not economically efficient until the development is complete.
Integration with existing waste management methodologies	5	System is the same as is currently operated by the waste collection authorities at present.
	3	System is similar to currently operated systems, requires no new collection infrastructure, but will require alternative methods of working.
	1	System is completely new in the region requiring new collection infrastructure and methods of working.
User friendly	5	System is simple to operate requiring no education of users.
	3	System is relatively simple but may require some education of users.
	1	System is complex which has the potential to cause confusion and thus misuse.
Adaptability of system	5	System is readily adaptable to allow for further segregation of waste streams in the future with minimal additional cost.
	3	System if fully adaptable but may entail some capital outlay.
	1	System cannot be adapted without excessive effort and capital outlay.
Infrastructure requirements	5	System requires no or negligible infrastructure to operate.
	3	System requires minor capital outlay on collection vehicles/waste containers
	1	System requires major capital outlay on collection vehicles/waste containers
Security	5	System is fully secure and it is highly unlikely that there will be unauthorised use of facility.
	3	System does not have security measures but is located in private space or is sufficiently small as to not attract unauthorised use.
	1	System located in public space with no security measures.
Neatness	5	System promotes tidy streets with little likelyhood of waste cluttering bin areas or impact from vermin.
	3	
	1	System is likely to lead to waste collecting around recepticals/may encourage vermin.
Innovation	5	System is relatively new to the collection and management of waste in the UK.
	3	System is relatively new to the collection and management of waste in the Region.
	1	System maintains the status quo.
Capital Cost	5	Capital costs are comparible or lower than the default waste managment method
	3	Capital costs are slighty higher than the default waste managment method
	1	Capital costs are signifcantly higher than the default waste managment method
Operational Cost	5	Operational costs lower than the default waste managment method
	3	Operational costs are comparable to the default waste managment method
	1	Operational costs are higher than the default waste managment method
Management	5	System requires no management beyond what is routinely undertaken by the user.
	3	System requires only routine maintenance and management.
	1	System requires regular management and maintenance which may require the employment of dedicated personnel.
* Scores of 2 or 4 to be used where criteria falls between definitions.		

Capabilities on Project Environment