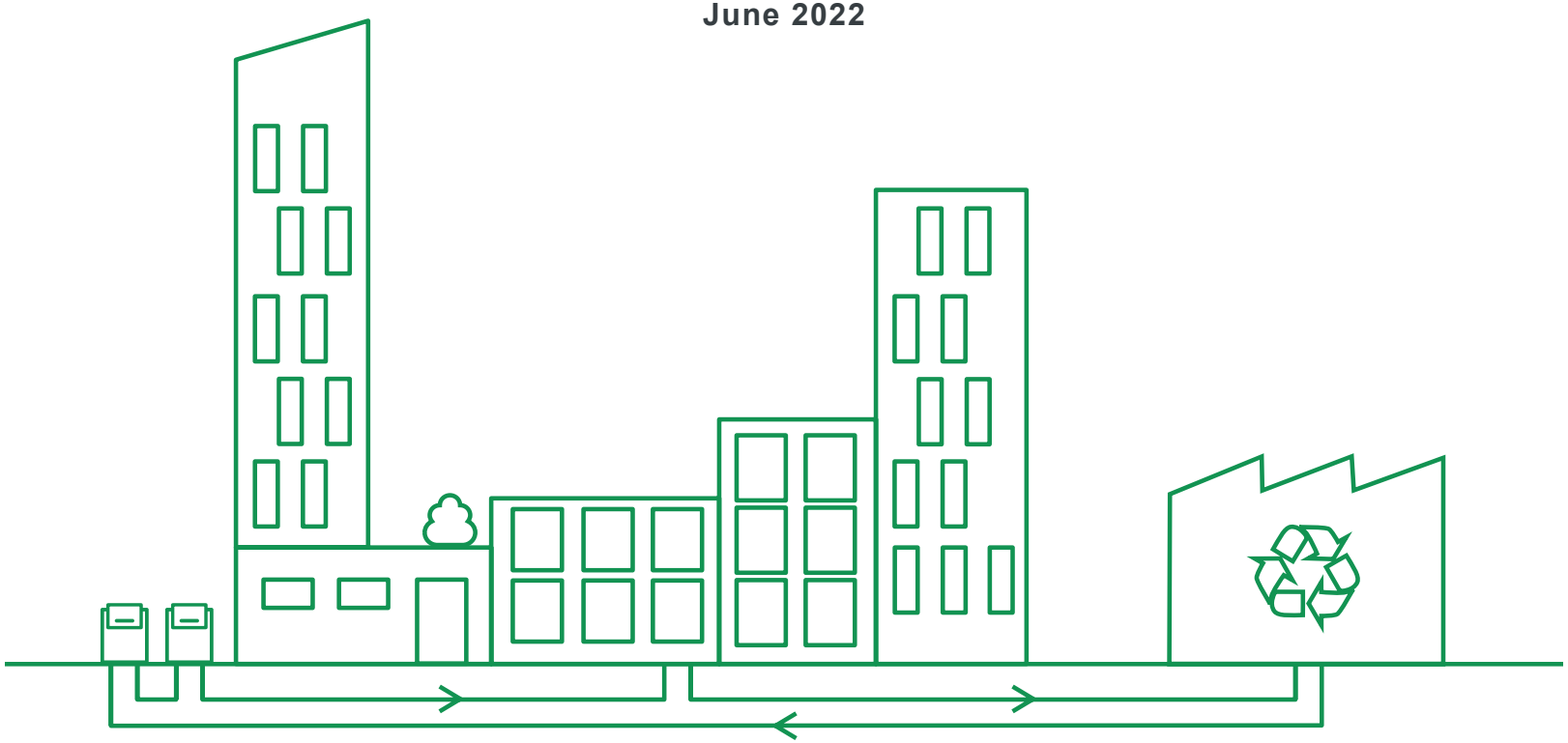
OPDC
OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

Waste Management in High-Density Development

Supplementary Planning Document

June 2022



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1 Introduction

HOW TO FIND OUT MORE

Visit our website

1.1. Documents for the Waste Management in High Density Development SPD can be read and downloaded from:

https://www.london.gov.uk/about-us/organisations-we-work/old-oak-and-park-royal-development-corporation-opdc/planning/supplementary-planning-documents/draft-waste-management-high-density-development-spd

View a hard copy

1.2. Paper copies of the SPD consultation documents are available to view during normal office hours at the following locations:

- Brent Civic Centre, Engineers Way, Wembley, HA9 0AF;
- The Collective, Old Oak Lane, NW10 6FF
- Harlesden Library, Craven Park Road, NW10 8SE; and
- Brent Hub Community Enterprise Centre, 6 Hillside, NW10 8BN

1.3. Alternatively, hard copies can be made available on request by contacting OPDC, either via email or by post (see above).

ROLE AND EXTENT OF THE SPD

What is the role of the SPD?

1.4. The SPD provides supplementary planning guidance to OPDC's Local Plan to:

a) add further detail to the Local Plan's policy EU6;
b) ensure that proposals deliver development which meets the London Plan and Local Plan municipal waste targets and delivers high quality homes and work space.

1.5. This document has been produced by OPDC. The guidance will be applied to all development proposals in the OPDC area.

Supporting Evidence documents

1.6. This SPD is supported be the following documents:

- OPDC Waste in Tall Buildings Study[1]
- OPDC Environmental Standards Study[2]
- LWARB Circular Economy Route map[3]
- OPDC Waste Management Strategy[4]

STATUS OF THE SPD

Legal status

1.7. This document is a Supplementary Planning Document (SPD). Part 5 of the Town and Country Planning (Local Planning) (England) Regulations 2012 sets out the procedure for the production of SPDs. This version of the SPD constitutes the consultation version required to be carried out under Regulation 12.

1.8. A Strategic Environmental Assessment (SEA) screening of the SPD has been carried out. This identifies that an SEA is not required.

Guidance status

1.9. The guidance in this SPD is a material consideration for the determination of planning applications alongside relevant policies in the OPDC Local Plan, the National Planning Policy Framework (NPPF), London Plan, Old Oak and Park Royal Opportunity Area Planning Framework, West London Waste Plan DPD, any 'made' Neighbourhood Plans and any other supplementary guidance.

1.10. The guidance in this SPD is consistent with the National Planning Policy Framework (NPPF) and does not conflict with the policies in the London Plan (2021) or OPDC's Local Plan.

1.11. The SPD supplements guidance within the NPPF, London Plan, Local Plan and other SPDs. Therefore, this SPD should be read in conjunction with these documents

1.12. The guidance period for the SPD aligns with

1: https://www.london.gov.uk/sites/default/files/57._waste_in_tall_buildings_2018.pdf)
2. https://www.london.gov.uk/sites/default/files/17._environmental_standards_study_0.pdf
3. http://www.lwarb.gov.uk/wp-content/uploads/2015/04/LWARB-London%E2%80%99s-CE-route-map_16.6.17a_singlepages_sml.pdf
4. https://www.london.gov.uk/sites/default/files/58._waste_management_strategy_2018.pdf

the Local Plan period from 2018 to 2038.

CONTEXT

1.13. As a functional body of the Mayor, OPDC is expected to demonstrate best practice in delivering regeneration including in achieving the Mayor's environmental aspirations set out in the London Environment Strategy and by delivering good growth that supports wellbeing and healthy communities. The targets set out for recycling in the Draft London Plan that OPDC are seeking to achieve are for zero biodegradable and recyclable waste to go to landfill by 2026 and for 65% of municipal waste to be recycled by 2030. As one of the Mayor's functional bodies, OPDC will seek to meet these targets.

Figure 1.1: SPD Structure

1. INTRODUCTION
Sets out the status of the SPD, consultation information and context.

2. VISION AND OBJECTIVES
Sets out the Vision and Objectives for waste management in development

3. CHALLENGES
Sets out some of the challenges of meeting the Mayor of London's recycling targets for Local Authority collected waste and commercial waste in an area of high-density development.

4. OVERARCHING GUIDANCE
Sets out the guidance for both residential and non-residential development in the form of Principles and Ambitions and provides supporting text. The principles are the guidance that should be achieved by all development within the OPDC area. The ambitions provide guidance that should be achieved if feasible.

5. GUIDANCE ON WASTE MANAGEMENT APPROACHES
Provides additional information on strategies that developers should consider on the different strategies that developers should consider when planning their waste management systems.

6. GUIDANCE ON USER ENGAGEMENT
Provides guidance on how developers should engage with building occupants, and put in place appropriate enforcements mechanisms.

7. CALCULATING WASTE CAPACITY REQUIREMENTS
This section provides guidance on the steps required to calculate the space required within development for waste management for residential and non-residential waste.

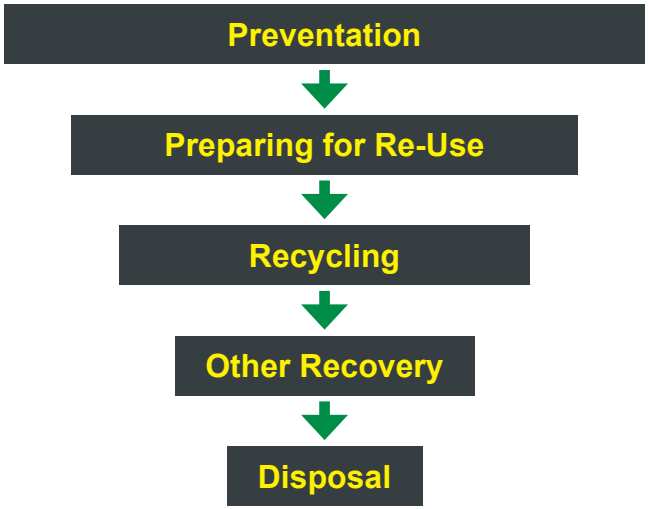
APPENDICES
Appendix 1: A case study using a generic high-density block
Appendix 2: Relevant Local Plan Policies and London Plan policies
Appendix 3: Glossary

1.14. OPDC encourages applicants to adopt the Mayor's waste hierarchy when planning their waste management strategies and ensure that residents have space to segregate 3 waste streams within units and communal storage areas.

1.15. Waste recycling in high-density developments and tall buildings is very difficult to achieve. Recycling rates in urban areas are in general low and the lowest rates are in flatted accommodation where less than 25% of waste is typically recycled. The reasons for this are complex but include a lack of space in flats to separate and store segregated waste streams; difficulty in managing central waste stores and in encouraging individual households to take personal responsibility for ensuring waste is disposed of with care; and the transient nature of the population.

1.16. The problem is exacerbated by the lack of national standards for space and the huge variation in waste collection processes as every waste collection authority is responsible for designing their own collection system. Every waste collection authority has its own policies and approaches to issues like use of compactors to reduce volumes of waste stored on site, the number and type of waste streams collected and the frequency of collection. As there are 3 waste collection authorities in across the OPDC area, OPDC is working with these authorities to ensure there is consistency in the way waste is collected. The variation in approach can have a very significant impact on the space a developer will be required to provide for waste collection.

Figure 1.2: Waste Hierarchy



1.17. The challenges are most acute in high-density areas because of the high number of people and associated levels of waste generated.

1.18. In mixed use development the issue is further complicated as space to store non-residential waste needs to be provided. This is usually collected by a private waste collection company, who will typically agree frequency and costs of collection with individual businesses.

1.19. The approach to waste collection has changed over time in response to changes in policy, technology and the economics of waste collection and recycling. Development will therefore need to be future proofed so that it can cater for changes in national policy, how waste is collected and consumer habits that impact on the type of waste generated.

1.20. This document sets out specific guidance on how high-density development should:

- address the challenges of achieving the Mayor of London's targets for waste recycling of residential and commercial waste;
- ensure there is sufficient space in appropriate locations within units, bin stores and waste collection areas to manage waste and meet OPDC Local Plan and the Mayor's London Plan policies;
- ensure approaches to municipal waste are approved by the waste collection authority;
- ensure space is provided to address changes in the volume or type of waste generated or in waste collection;
- ensure that appropriate infrastructure is provided to help manage waste to a high standard
- adopt appropriate resident engagement strategies to support the attainment of the London Plan recycling targets.

2 Vision and Objectives

VISON

OPDC, working with the Mayor of London and the London Waste and Recycling Board, will demonstrate leadership in promoting development that develops strategies and infrastructure which promotes high levels of waste recycling and best practice in waste management.

OBJECTIVES

This SPD provides guidance on how to achieve the following objectives in high density developments:

1. To design and operate high density development in a manner that will help residents and facility managers meet the Mayor's targets to recycle 50% of Local Authority Collected Waste (LACW) by 2025 and 65% of Municipal Waste by 2030;

2. To ensure applicants are aware of these targets and have strategies in place to help residents and businesses meet these targets;

3. To ensure there is sufficient space and appropriate facilities within units, buildings and blocks to segregate and store 3 residential waste streams (dry recyclables, food and residual waste);

4. To ensure there is adequate space and appropriate facilities to store and segregate commercial waste, including specialist waste streams where necessary; and

5. To encourage applicants to work with residents to ensure they understand how the waste collection and recycling systems operate and to encourage recycling.

OUTCOMES

The outcomes the guidance seeks to deliver includes:

1. New high-density development in Old Oak and Park Royal meeting and where feasible exceeding the Mayor's recycling targets;

2. Waste within developments is well managed, residents are fully engaged, understand and make best use of the waste management facilities; and

3. Waste storage and collection is fully coordinated with the waste collection authority who achieve high recycling rates.

3 Challenges

3.1. The proposed level of investment in transport infrastructure and the planned public transport accessibility improvements, on a brownfield site in transport zone 2/3 in west London, provides a strong rationale for the design and delivery of new high-density development including new tall buildings in appropriate locations.

3.2. To achieve the homes and jobs targets for the area, the Development Capacity Study by OPDC shows that densities will have to achieve 450 units per hectare on average across the OPDC area. Densities will range across the area, with lower densities and building heights in more sensitive locations and increased densities and building heights away from sensitive locations and in areas of high public transport accessibility.

3.3. The development will include a range of building heights including tall buildings (defined as over 15 residential storeys or 48 metres above ground level).

3.4. Based on London residential communal waste arising information, it is anticipated that approximately 17,452 tonnes of household waste will be produced per annum when the development is complete. The complex mix of residential and non-residential uses will generate a wide range of waste arisings and collection systems.

3.5. There will also be a considerable quantity of commercial waste arising across the development for which provision must be included.

3.6. Managing this amount of waste and ensuring that there is enough space to store waste between collections is challenging. This is further compounded by the Mayor's ambition that 65% of municipal waste should be recycled by 2030. New development in Old Oak and Park Royal will need to demonstrate they have approaches in place to enable high levels of recycling.

3.7. The factors that make recycling challenging in high density development are complicated and include:

- Lack of space in units to segregate waste;
- Poorly designed, located and maintained communal bin stores;
- Lack of understanding by, and information provided to, residents and businesses about what to recycle and how to use facilities;
- Lack of individual responsibility for managing waste in communal waste areas;
- Poorly managed shared facilities that encourage anti-social behaviour;
- No incentives to segregate and recycle waste (and often a disincentive);
- Limited access to bin stores by waste collectors, which can impact on waste segregation; and
- A mismatch between waste collection authority strategies for waste collection and processing and the approach adopted in developments, including the number and types of collections, and disposal and recycling strategies.

3.8. Appendix 1 presents an indicative high-density development plot. This shows some of the challenges that need to be addressed when implementing waste management systems at high densities and within mixed use buildings. An important consideration is the need to manage waste arisings and collection within the building envelope to conform with Policy T7 b) of the Local Plan. This will require careful space planning to manage the movement of waste over several levels within the building.

3.9. The indicative plot (see figure 9) highlights the challenges of providing waste management systems in areas with varying topography and severance caused by infrastructure. This is likely to require waste infrastructure provision across multiple levels depending on residential and commercial access and distances residents must travel to bin stores.

3.10. Experience of managing waste at the densities proposed in Old Oak is also relatively novel in London. Local authority waste collection systems are usually not designed to cope with high density mixed use development and may need to be adjusted.

Figure 3.1: Smart bin technology (segd.org)

4 Overarching Guidance

4.1. The guidance sets out Principles and Ambitions. Proposals will be required to comply with Principles. These will ensure waste is coordinated and well managed across the area and in a way that supports the Mayor's objectives to divert as much municipal waste as possible from landfill or incineration. The Refuse and Recycling Operational Waste Plan (RROWP) that should accompany the planning application should demonstrate that the principles have been addressed.

4.2. Ambitions set out more challenging requirements which proposals are encouraged to adopt, as these will contribute to achievement of improved waste management standards and higher rates of recycling, which will benefit the whole area. OPDC will support and work with applicants to identify how these ambitions can be delivered.

4.3. The supporting text provides additional information on how to develop the guidance.

Figure 4.1: Household waste composition (London Environment Strategy, 2018)

Principle W1: Residential Development

To deliver development that supports the Mayoral waste recycling targets, proposals should:

a) submit a Refuse and Recycling Operational Waste Plan (RROWP) as part of the planning applications;
b) have consulted with and agreed the RROWP with the relevant waste collection authority;
c) provide In-building waste management and storage solutions that are well integrated with the waste collection authority collection system;
d) engage early with waste operators and OPDC to potentially adopt a strategic waste technology system where one has been established;
e) provide adequate space in a convenient location within dwellings to allow for separation and storage (for a convenient period) for dry recycling, food and residual waste in accordance with London Waste Recycling Board's (LWARB) guidance as set out in Table 4.1 of the supporting text;
f) exclude the use of maceration technologies to manage waste;
g) provide residential waste infrastructure that:
    i) does not require residents to travel more than 30 horizontal metres (exclude vertical distance) from their residential unit to a waste deposit point and;
    ii) does not require the waste collection operative to pull a bin that is less than 240 litres more than 15 metres, or a bin that is 240 litres or more, further than 10 metres to the collection point;
h) position waste deposit points in easy to access areas for residents;
i) provide sufficient waste storage capacity within a residential block for dry recyclables, food waste and residual waste to be stored separately between waste collection cycles. The volume of waste to be stored should be calculated using the method set out in section 5 and will depend on the frequency of waste collection, which must be agreed with the relevant Waste Collection Authority;
j) provide bin collection stores in off-street servicing facilities to comply with OPDC's Local Plan Transport Policy T7 b);
k) provide provision for bulky waste storage within each block;
l) provide and maintain a positive visual amenity i.e. tidy and clean waste management areas, with an absence of spillages or uncontained waste around and within bins and bin stores;
m) include within the RROWP provision for managing waste in perpetuity, including covering all costs;
n) include within the RROWP a statement setting out long-term use, maintenance and funding of any software or other technology that is deployed;
o) provide communications and signage that is easily understood by different nationalities with varying proficiency in the English language.

Ambition W1: Residential Development

Proposals are encouraged to take additional measures including:

a) providing a system that encourages a sense of personal responsibility for correct segregation of waste and use of waste management service/ infrastructure. This could include linking use of service to individuals or households via technology (e.g. smart bins) and/or monitoring (via CCTV and caretaking staff);
b) providing building caretaker(s) with a clear waste management role, including engaging with residents to encourage good recycling behaviours;
c) providing solutions that facilitate the collection and reporting of Management Information (MI) on the amount and type of waste generated, to support evaluation, analysis and active management of waste;
d) establishing freehold/leasehold and rental conditions that include clear obligations on residents to use waste management facilities in the correct way;
e) providing facilities that promote re-use or recycling of bulky items; and
f) providing multi-channel communications to inform users about the waste management service and encourage desired recycling behaviours.

SUPPORTING TEXT

4.4. Research conducted for the Waste and Resources Action Programme (WRAP) on the common characteristics of high performing recycling schemes from around the world identified some core characteristics and principles that support good levels of recycling. The key characteristics are:

a) Provision of sufficient space in a convenient location for the separation and storage of different waste streams for a convenient length of time within residential and non-residential units.
b) Provision of sufficient space in communal bins for the containment and collection of residential waste that maximises recycling.
c) Provision of sufficient waste storage facilities for the segregation of commercial waste streams.
d) Provision of management systems that encourage a sense of personal responsibility for segregation and use of waste management services/infrastructure.
e) Provision of a facilities manager who actively manages waste and engages residents.
f) Well-maintained tidy and clean waste management areas.
g) Fully accessible multi-channel communications and signage to support management and encourage desired recycling behaviours
h) Contractual agreements with residents that include clear obligations on management of waste and use of facilities.
i) In-building waste management and storage facilities that are fully integrated with the Waste Collection Authority's collection systems and with capacity to adapt to changes in waste composition or collection systems.
j) Use of smart technology and innovation where it can help manage waste and aid recycling across the development.
k) Space for bulky materials and systems to encourage reuse and recycling of bulky materials.
l) Facilities and systems that support the collection and reporting of waste management information to help identify and address performance issues.

4.5. UK government and Mayoral policies are continuously evolving to respond to changing concerns about waste, its composition, consumer behaviour, advances in waste treatment technologies, the cost of waste collection and disposal and other issues. Applicants should therefore demonstrate how their proposals have been future proofed and can respond to change

4.6. Development proposals will need to demonstrate they are responding to the most current policies at the time an application is submitted. Developers will be expected to submit a Refuse and Recycling Operational Waste Plan (RROWP) as part of the Sustainability Statement to support planning applications.

4.7. Waste collection authorities, which are part of the Local Authority, are responsible for managing collection of residential waste within a Borough. In London each waste collection authority has its own approach to waste collection. Waste collection changes over time in response to government policy and Mayoral policy. These changes can impact on the way in which waste is segregated and managed within development. For example, there are proposals in the draft new London Plan to increase collection of biodegradable waste.

4.8. The key driver of good waste management in development is provision of adequate space within apartments and communal storage areas. Sufficient space should be provided in kitchens to enable waste to be segregated into dry recycling, food waste and residual waste streams. A two-bin system should be provided in bathrooms for dry recyclables and residual waste, but minimum sizes for these bins is not specified.

4.9. Table 4.1 sets outs the minimum required bin volumes that should be provided within the kitchens for different sized homes. The bin sizes are designed to encourage recycling and to accommodate a minimum of three days waste storage. Kitchens should have sufficient space for integrated bin units. Bins should be colour coded following guidance on colour schemes suggested by WRAP through its Framework for Greater Consistency in Recycling in England.

4.10. Food waste bins should be designed to allow residents to easily remove and clean the bin and to transfer food waste from the home to the communal food waste deposit point.

Table 4.1: In-Home Kitchen Bin Volume Guide

	1–3 Bedroom Household (litres)	4+ Bedroom Household (litres)
Mixed Dry Recycling	**25**	**30**
Food Waste	**5**	**5**
Residual Waste	**25**	**30**

Figure 4.2: Illustration of integrated waste recycling facilities in a kitchen

4.11. In some areas macerators are used to treat food waste. However, the risks of failure in tall buildings, the goal to recycle food waste and the need to minimise flows to Counters Creek, which is already at capacity, mean that macerators are not being encouraged in the OPDC area.

4.12. In conformity with Part H of the Building Regulations, communal bin stores should be located no more than 30 vertical metres from the front door of an apartment. In some large-scale blocks, it may not be possible to meet this requirement. Intermediate bin stores may therefore be required. These should be located so they are convenient to use. Studies by WRAP show that where bin stores are in inconvenient areas, they tend to be poorly used and managed. In practice the best locations are on route to the main entrance/exit usually close to stair and lift cores.

4.13. Tall buildings, transporting waste in communal elevators is often deemed to be anti-social. Providing chutes is an alternative approach. Design of chutes has improved. They now have wider apertures to prevent blocking. They are easy to access and have remote sensors, so they can be unblocked more easily. They are often self-cleaning and are designed to eliminate smells. Insulation can be provided to minimise noise impacts. Controlled access to chutes is advisable. Further details about chutes is provided in Section 6.2.1.

4.14. Waste collection vehicles need to be able to access bins so that bins don't have to be moved more than 10-15 metres (depending on size of bin) by the waste collector. This may mean that waste will have to be transported from intermediate stores to a central store by a facilities management team, thereby increasing the total area of space required to store waste. These collection points should be in servicing areas within buildings. Vehicles may be needed to tow bins to collection areas. Good access will be required between intermediate stores and collection points. In some cases, bins may have to be moved between floors and dedicated service elevators may be required.

4.15. Sorting waste on streets, unless in a purpose designed area, is likely to impact on congestion and traffic movement.

4.16. Sufficient storage to accommodate all the waste that needs to be stored on site should be provided. The method for calculating this is included in section 5 of this document and should take account of the frequency of collections to be agreed with the waste collection authority and included in the application. Contingency arrangements should be made in case the waste collector does not pick up waste, for example during the Christmas period. The developer should agree actual collection cycles and servicing arrangements with the waste collection authority as part of the planning process. Evidence of this should be provided as part of the RROWP. Details on calculating the space required are provided in section 5.

4.17. Provision of space for bulky waste should also be made within the site. The Mayor is promoting reuse, repurposing and repair before disposal. Developers should consider establishing a sharing portal that allows people who no longer want goods to offer them to the wider community via an online community hub. This could contribute to a circular and sharing economy that the Mayor and OPDC are promoting.

4.18. Communal bin stores are often poorly managed. Once a store starts to look uncared for, people often dump their waste either on the ground or in the wrong bins. Poorly maintained areas that smell, are contaminated by spills and generally not cleaned quickly can encourage anti-social behaviour and a lack of pride or care. It is important to maintain these areas to a high standard. Smart technology including CCTV, access controls, bin sensors etc. can be used to manage waste stores and support more efficient collection.

4.19. Where space is tight, it is possible to use compactors and shredders to reduce the volumes of waste stored on site. On some sites, in vessel composters can be used to treat biodegradable waste. These systems can produce compost that can be used in communal allotments and gardens. Not all local waste collectors will accept compacted,

shredded or processed waste. Developers will need to agree use of these systems with the waste collection authority during the pre-application phase.

4.20. Alternative waste collection systems are being developed and have been adopted in the UK and overseas. They include underground and pneumatic waste collection systems.

4.21. Underground systems are typically located within the public realm but could be placed in other areas. Depending on the underground system used, these bins may require a purpose designed truck to lift bins out of the ground. The advantage of these systems is that they require less space above ground, they are cleaner and need fewer operatives to collect the waste. The cost of installing these systems however is higher than a conventional bin store but they are generally cheaper to operate. It may be difficult to find space in the public realm to locate these facilities and where they are adopted, the applicant will have to demonstrate that they can be accommodated without impact on the public realm or street.

4.22. The developer will have to coordinate use of underground systems with the waste collection authority who may require the applicant to contribute to the purchase of a vehicle to lift and remove bins.

4.23. Some developments around the world are using underground pneumatic waste collection systems, especially in dense urban locations. These systems minimise disruption at street level by significantly reducing truck movements. They reduce space take above ground and within buildings. They are clean and easy to operate and they can easily be incorporated into the public realm. In addition, whilst the cost of installation can be high they are cost effective to operate. They do need to be carefully integrated with other services. They need to be appropriately managed and maintained. These systems can either be incorporated into the public realm or into the development and accessible only to the tenant/occupant. It may be possible to integrate these systems with chutes but this has not been tried in the UK before and is potentially more difficult to maintain. Complicated level issues and additional bends in service pipes would also have to be factored in.

4.24. Decisions about which system or blend of systems to use will require detailed spatial analysis, agreement with the waste collection authority, assessment of capital and revenue costs and an assessment of potential space savings.

4.25. Further information about underground and pneumatic waste collection systems is provided in section 6.

4.26. Caretakers or facilities teams could be trained to engage and provide support and encouragement to residents as part of a behavioural change programme. Evidence suggests that getting support from residents is crucial for increasing recycling rates and on-site staff can play a key role in engaging residents.

4.27. Innovation in smart waste systems is also impacting on the way waste is and will increasingly be managed on sites in future. Smart systems enable waste to be tracked from source to point of treatment or disposal. It allows waste facilities to be managed remotely and for access to be controlled. It can support better and more targeted engagement, monitoring and intervention. It can also help with management of collection, enabling more targeted collection when bins are full.

4.28. Signage that is easy to follow and multi-lingual is important and should be provided in homes, bin areas, bulky deposit sites and elsewhere. Inductions should be provided for new residents to explain how waste management systems work. Information can be targeted and shared through different channels to suit different needs and ways of accessing information.

4.29. Systems should be designed so that data on waste generation, segregation and collection. can be collected. This will help operators understand how residents are using facilities, where systems are working or failing and how they can be improved. It can also help those involved in waste management to design focused interventions to help improve waste management and recycling.

4.30. Applicants will be expected to demonstrate as part of the pre-application process that they are conforming with the waste principles set out above where the development is residential.

Principle W2: Non-Residential Development

To deliver development that support the London Plan waste recycling targets, proposals should:

a) provide adequate space in non-residential units to allow for waste segregation;
b) exclude the use of maceration technologies to manage waste in non-residential units;
c) ensure there is sufficient bin storage space to accommodate waste between collections and allow for segregation of waste into different waste streams;
d) position waste deposit/collection points in areas that are readily accessible by the business occupier to make waste disposal as easy as possible;
e) provide enough space so that change for example in possible uses or waste composition can be accommodated;
f) provide off-street servicing facilities to collect waste, in accordance with Transport Policy T7 b) in the Local Plan;
g) provide waste infrastructure that does not require the waste collection operative to pull bins more than 25 metres to a vehicle collection point;
h) within the RROWP, set out how waste will be managed and how staff costs will be met where staff will be required to manage systems once installed;
i) provide a plan for the long-term use, maintenance and funding of any software or other technology that is deployed; and
j) provide communications and signage that should be able to be easily understood by different nationalities with varying proficiency in the English language.

Ambition W2: Non-Residential Development

Proposals are encouraged to take additional measures to support waste recycling including:

a) establish freehold/leasehold and rental conditions that include clear obligations on business tenants to use waste management facilities in the correct way.
b) put in place arrangements to procure, manage and require the use of a single commercial waste management contract. This will require:
    i) an organisation to manage the procurement;
    ii) a management team to manage the contract;
    iii) contractual arrangements to be put in place to obligate businesses;
c) provide a system that encourages a sense of personal responsibility for correct segregation of waste and use of waste management service/infrastructure. This could include linking use of waste facilities to individual businesses via technology (e.g. smart bins) and/or monitoring (via CCTV and caretaking staff);
d) provide building caretaker(s) with a clear waste management role, including engaging with businesses to encourage good recycling behaviours and the use of any infrastructure provided to support recycling; and
e) provide solutions that facilitate the collection and reporting of Management Information (MI) on the amount and type of waste generated by waste stream so that this MI can be used to identify performance issues and evaluate impacts of additional interventions.

SUPPORTING TEXT

4.31. The Mayor is promoting commercial waste recycling in London. The London Environment Strategy sets a target for 65% of all municipal waste to be recycled by 2030. Municipal waste includes local authority collected waste, and some elements of commercial waste. To achieve the target of 65% of municipal waste being recycled, as set out in the London Environment Strategy.

4.32. Recycling of commercial waste in high density developments is difficult as space is often constrained. The complicated interplay between infrastructure and topography, the size of blocks, mix of uses and constrained access mean that space for waste will have to be carefully managed. Intermediate storage space may be required to minimise distances waste must be transported by businesses.

4.33. Applicants can help make waste management and recycling as easy as possible by:

» providing sufficient space for commercial tenants to separate waste into relevant waste streams (general waste, dry mixed recyclables, food and other streams depending on the business type);
» ensuring that the stores are easily accessible and have well defined areas for different waste streams;
» providing separate storage facilities for commercial and residential waste; and
» ensuring that good back of house facilities and accessible routes are provided between commercial units and waste collection stores and collection points.

4.34. It is difficult to calculate the space required for commercial waste within units as different businesses generate very different amounts and types of waste. A simple method to calculate the waste required is

provided in section 5. The space requirements will depend on the frequency of collection. This needs to be tested and evidenced in the RROWP.

4.35. In general, OPDC will discourage the use of macerators primarily because the sewer network is already at capacity and the overall strategy for waste water is to minimise impact on the sewer system.

4.36. Waste collection facilities need to be provided in areas that are both easy to access by non-residential occupiers and waste collection companies. Success in managing waste and meeting the Mayor's recycling targets is closely related to how convenient and how well laid out and managed these facilities are. Space should be set aside for storage of different waste streams.

4.37. Flexibility should be built into the design of waste facilities to allow for changes in composition and amount of waste generated. Changes in legislation may impact on waste requirements.

4.38. In general, waste management including waste collection facilities should be in off-street servicing areas within the development rather than in the public highway or publicly accessible areas to minimise impact on the public realm (see policy T7 in the OPDC Local Plan). Waste collection vehicles should be able to get very close to waste bins to minimise the distance bins must be moved. As a maximum, bins should not have to be moved more than 25 metres and where they do have to be towed or dragged a clear and fully accessible route should be provided so that one person can transfer bins.

4.39. Consideration should be given to whether waste collection facilities can be shared with residential tenants. Any arrangements to share waste collection would have to be agreed with the waste collection authority and others involved in managing, collecting and disposing of waste.

4.40. Waste must be collected within dedicated service areas within buildings or on plot to minimise impact on the road network. In some cases, it may be possible to plan for provision of collection points within the public realm but this would need to be agreed as part of the application process.

4.41. Because of the complexity of accessing and servicing these mixed-use plots, it may be necessary for a facilities team or on-site caretaker to manage and move commercial waste between intermediate waste stores and waste collection areas. In these circumstances the developer will need to show how these arrangements will be managed and funded in perpetuity.

4.42. To promote good waste practice and waste recycling, developers should consider adoption of freehold and leasehold rental agreements that set performance measures for waste management.

4.43. In high-density blocks where there is a sizeable number of non-residential tenants, applicants are encouraged to consider setting up consolidated waste collection systems that all non-residential tenants are required to adopt. This could help reduce cost of waste collection for individual tenants as one commercial waste collector can collect many different tenants waste at the same time. This can provide other benefits, including:

- Enabling use of shared storage and facilities like compactors etc.
- Reduced number of vehicle movements.
- Where the volume of waste collected increases it can be easier to justify collection of separate waste streams.

4.44. Procuring a consolidated waste collection service will need to be led by the developer/ management company. Consideration should be given to how non-residential tenants will be encouraged to use consolidated waste facilities.

4.45. Smart technologies can be used to help manage waste separation, storage and collection and support consolidated waste collection and possibly sharing of waste facilities with residential tenants.

4.46. The use of smart technology can also be combined with management information systems that can be used to help monitor and refine waste management facilities.

4.47. Smart systems can also facilitate the use of underground and automatic waste collection systems, for example by managing access to these systems through smart key fobs, by including weighing systems, and by helping collectors know when bins are full and in need of collection.

4.48. Applicants will be expected to demonstrate as part of the pre-application process that they are conforming with the waste principles set out above where the development is either wholly or partially non-residential and that they have successfully incorporated all the requirements in their application prior to completion of the development.

5 Guidance for Waste Management Approaches

5.1. This section describes some of the approaches that can be adopted to facilitate waste management in high density developments. The section covers systems that support the efficient management of waste and promote recycling.

5.2. The themes covered include:

a) food waste disposers/macerators;
b) chutes;
c) bin stores;
d) collection facilities;
e) user engagement; and
f) smart technology

FOOD WASTE DISPOSERS/MACERATORS

5.3. Food Waste Disposers (FWD), or macerators, are units attached to sinks that grind or macerate food waste into small pieces, which are washed or flushed into the sewer system. At the waste water treatment plant, organic waste is separated out and is treated, usually through Anaerobic Digestion (AD). Whilst maceration can make food waste treatment easier, it can place significant strain on water and sewage networks. Water and sewage arising from development in Old Oak and Park Royal will feed into sewage networks which is already at capacity. OPDC are required to minimise release to this network and therefore require FWD to be excluded from all new developments.

5.4. The direction of legislation on FWD's should also be noted. In Scotland the use of FWDs has been banned for non-domestic use. On 1st January 2016 legislation came into effect that meant that all businesses producing more than 5kg of food waste per week are required to present it for recycling. FWDs cannot be used except in rural areas.

5.5. The Welsh Government is also investigating the possible introduction of a commercial food waste to sewer ban.

5.6. There are no plans for these bans to be extended to cover domestic waste, nor for bans to be introduced in England. However, the existing bans have been introduced in response to targets and lobbying which are common across the whole of the UK and there is a possibility of future bans on the use of these systems may be considered.

5.7. Principles for guiding food waste disposers/ macerators are provided in principles W1 and W2.

CHUTES

5.8. Developers are required to adopt a comprehensive waste management system for the transfer of waste from the home to a central deposit point, to help meet the principles for high recycling performance required by the Mayor of London.

5.9. The following section sets out implementation options that could be adopted to achieve the principles set out in section 4.

5.10. The main infrastructure systems that OPDC consider appropriate for a development of this nature are briefly described along with an overview of the advantages and disadvantages of each system.

Principle W3: Chutes

a) A one chute system with separation units at the base of the chute is preferred to minimise impact on void space required to accommodate the chute system (see figure 5.1). However, a multi-chute system may be considered where there is strong justification to do so. A seperate chute for food waste is used in some cases to prevent contamination.
b) The disposal system must accommodate three-stream segregation at the base of the chute. Waste deposited in chute systems will exit into appropriate bulk bins beneath the chute opening (controlled by resident waste type selection at access point).
c) Clear and easy to understand signage and colour-coding should be used to indicate how to deposit different waste streams.
d) Consideration must be given to system design to minimise deposit of waste around chutes hoppers.
e) Design should minimise risk of blockages and have systems for identifying and clearing blockages quickly and efficiently. Trained facilities management staff will need to be available to clear blocked hoppers promptly.
f) Consideration should be given to reduce risk of glass breakage within Dry Mixed Recycling (DMR) bins and other health and safety risks.
g) Appropriate extractive ventilation should be used within the chute and storage area to manage odour issues. Chutes should be equipped with shutters to avoid risk of injury to caretaking staff when replacing bins. Chutes should fall vertically where possible without slopes or bends, with bin stores directly beneath each chute to minimise potential for blockages.
h) Chute design should comply with British Standard BS 1703 (Specification for Refuse Chutes and Hoppers) or any subsequent updated standards.
i) An analysis of the strengths and weaknesses of chutes is set out in table 5.1.

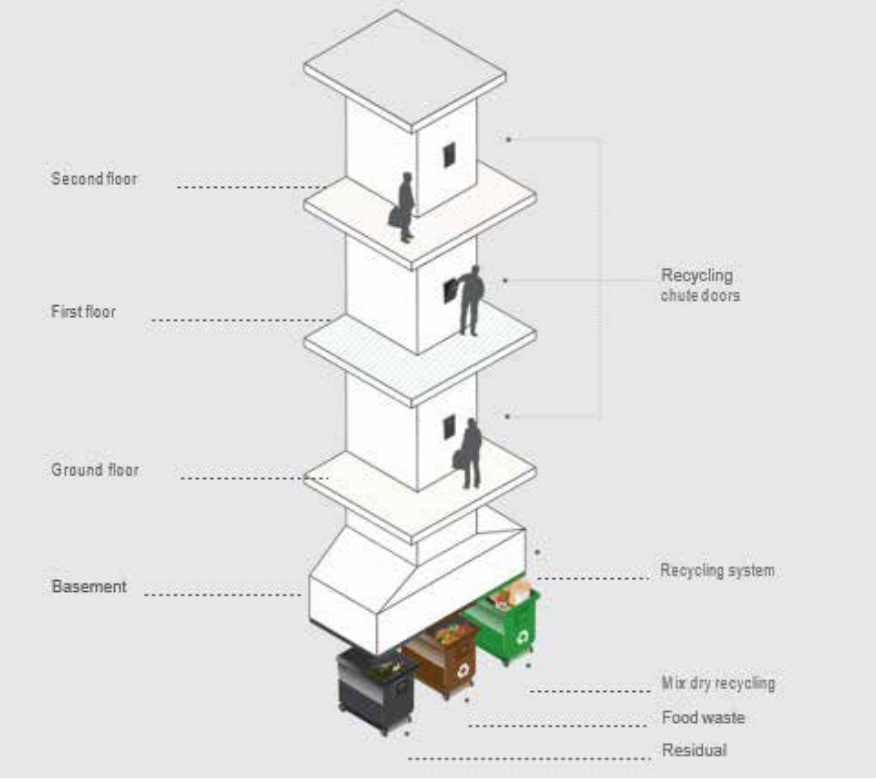
Gravity Chute System

5.11. Gravity chutes are intended to make it easier for residents to dispose of waste and recycling. Where a building has a chute system, residents are responsible for depositing waste into the system via a hopper in a hall-way on the same level as their residence. Modern systems can be designed to support three-stream segregation. (see figure 5.1).

5.12. Waste is collected and stored at the base of the chute either at podium level or basement level within wheeled bins. Bulk bin storage areas are not typically accessible to residents. Facility managers are responsible for monitoring and managing waste, including switching wheeled bins over when full. Bins are moved to central collection points on a regular basis for collection by the Waste Collection Authority.

5.13. It may be possible to connect the chute system to a pneumatic system as part of a site wide strategy. This will require careful integration and testing as this has not been tried before in the UK.

Figure 5.1: Single Waste Chute System With 3 Waste Streams



Chute: Good Practice Example

The chute system at Battersea Reach, London has a clear control panel to enable the disposal of different waste streams, although labelling could be improved.

The ‘protected lobby space’ with sloping floor aims to discourage dumping of waste around the chute. User instructions are clearly provided above the hopper. A separation facility at the base of the chute directs waste into the correct bin.

Figure 5.2: Chute system at Battersea Reach (credit: Hardall.co.uk)

Table 5.1: Analysis of Strengths and Weaknesses of Chute systems

	Advantages	Disadvantages
Technical Complexity	» Modern chutes can have wide aperture that is less prone to blockages » Modern chutes can be designed with controls on access » Modern chutes can be designed to extract smell » Chutes can be designed to receied different waste streams » Chutes can be design with sensors and self-cleaning systems	» Chutes can still become blocked and will require monitoring and unblocking using approved methods. » Boxes, especially pizza and larger boxes can block chutes » Chute electronics need regular servicing and ad-hoc repair to correct faults. » Bins often need to be moved from an intermediate storage facility to a final collection point requiring management, which can be costly.
Land Take	» Deposit points are often conveniently positioned for residents » Avoids need to carry waste in lifts which can be smelly and result in spills » Can integrate into lift and stair cores	» Depending on building configuration may require space in each core for chute and collection system may require a second central waste area from which the WCA will collect. » Need to provide clear access between bin stores at base of stores and collection point.
Capital and Operational Costs	» Reduced overall space take can free up land for viable uses. » Controlled access to bin store and smart systems can minimise poor use	» Capital cost is estimated to be £6,000 per floor per core plus additional maintenance costs » Needs to be designed into the building service plan from early stage » Facilities staff required to transfer returning bins to/from collection point and maintain stores. » Health and safety risk associated with manoeuvring heavy bulk bins. » May require dedicated vehicle to pull bins to collection point.
Maximising Recycling	» Provides a convenient and accessible point of deposit for residents. » Minimises distance residents are required to travel with waste. » Minimises potential for waste leakage in communal areas » Relatively clean and tidy environment for residents as bins are hidden. » Can nudge residents to recycle at user interface points » Automatic waste stream separation can be designed to make contamination of dry recycling stream with residual or food waste more difficult as user required to make conscious choice NOT to select recycling when accessing chute.	» Blocked chutes may lead to waste being dumped within or outside chute access points. » Requires a smart chute waste separation system and different coloured bins and sacks in households to help reduce cross contamination of waste streams. » Relatively difficult to identify residents misusing system. » Waste is invisible to residents once deposited in a chute so they are potentially less primed to adopt waste recycling behaviours.
Future Proof	» Use of smart technology solutions such as bin fill telemetry, controls and tractability (sensors) can be added.	» Fixed infrastructure can be difficult to upgrade/change. Limited ability to adapt to future changes in waste composition (e.g. growth in take away Pizzas generates substantial number of pizza boxes and rise of Amazon and other on-line shopping generates rapid growth in packaging waste

COMMUNAL BIN STORES

Principle W4: Use of Communal Bin Stores

a) In general communal bin stores should be located off the road within service areas. An intermediate bin store may be needed where bin stores are more than 30 horizontal meters from the front doors of residents.
b) Where the bin store is located more than 10m from a servicing area that can be accessed by a waste collector vehicle, site caretaking staff will be required to manoeuvre bins to a collection point agreed with the waste collection authority. For bin stores within 10m of an agreed pick up point, the waste collection authority collect directly from the bin store. Where there is restricted access, the waste collection authority will need access rights. These will need to be maintained and arrangements made for collection throughout the year.
c) Bin stores should be in a convenient location to allow residents easy access on the way in and out of the building as part of normal day to day activity (i.e. avoid locating in a place that residents have to go out of their way to use if possible).
d) Bin stores should be carefully sited to avoid noise, odour, litter and fly tipping. The design should be carefully integrated into the building to minimise impact on the street. Appropriate extractive ventilation should be installed to manage odour issues. Bin store areas should be kept clear and clean to minimise misuse and dumping of unsorted waste.
e) Controlled access to bin stores should be considered as it helps prevent use of bins by non-residents. Consideration should be given to whether stores will be shared with commercial tenants and if so how this will be managed.

SUPPORTING TEXT

5.14. Communal bin stores are widely used in developments with apartments. Residents are usually responsible for transferring recycling and waste from home to a communal bin store located at podium, ground floor or basement level.

5.15. There are some variations of the communal bin store, for example in The Barbican caretakers collect waste from purpose built secure cupboards within apartments and transfer the waste to a communal bin, and in some developments waste is collected from shared stores on each floor.

5.16. Use of ID card/tag access, especially if linked to individual household ‘account’ will allow for careful management and control, gathering of metrics on usage and for targeted education / enforcement activity.

Challenges with Conventional Bin Stores

5.17. The biggest challenge with conventional storage systems is land take. In high density development the sheer volume of waste generated each week by residents requires very large storage areas. Where this is above ground and/or in buildings this can have a significant impact on the public realm or the building. It is for this reason that high density development has been looking to adopt non-conventional systems including undergound and pneumatic systems.

5.18. Volumes can be reduced if compactors, shredders and other pre-collection systems are used, but the capital and operating costs can be high. Where land prices are high and space can be freed up to deliver additional developable space, investment in waste processing facilites may make commercial sense.

5.19. On-going costs to run and maintain systems will need to be covered by the deveoloper and the impact on service charges considered. Smart technologies can also be used to help manage waste sites more efficiently.

5.20. An analysis of the strengths and weaknesses of conventional bin store systems is set out in Table 7. In addition, the strengths and weaknesses of compactors and smart technologies is set out in table 5.4.

Conventional Bin Store: Good Practice

At this development in Hackney, communal bins make clear use of signage with sufficient storage capacity for each waste stream. This allows easy use of facilities and limits issues with contamination.

Figure 5.3: Good practice communal bins, Hackney (credit: WRAP Recycling Now)

Poor Practice

The layout and management of this communal bin store in Hounslow is poor with no clear signage or instructions. Combined with insufficient storage capacity this results in high levels of contamination of the recycling streams and disposal of recyclables in refuse streams.

Figure 5.4: Poor practice communal bins, Hounslow (credit: Eunomia)

Table 5.3: Analysis of Strengths and Weaknesses of Conventional Bin Store systems

	Advantages	Disadvantages
Technical Complexity	» Conventional system is familiar to residents and waste collection authority.	» It can be difficult to maintain and manoeuvre bins for 3 waste streams at very high density » Not always fit for purpose and generates high traffic flows unless compactors and other on-site waste reduction systems used
Land Take	» It is relatively flexible and can be reconfigured to accommodate changes in waste composition and collection.	» A significant amount of land take is required to store waste. » Bins may need to be shifted around which can be complicated if there are lots of bins » Space is needed for collection vehicles
Impact on WCA	» Conventional system familiar to most residents. » Requires no change in waste collection ehicles	» If access to bin store is controlled, there is a risk that collection crews may not get access where they are collecting bins directly from storage areas. It may not be realistic to assume keys or codes will be reliably carried, nor that the same crew or vehicle will collect the bins on each occasion.
Capital and Operational Costs	» Relatively low initial implementation cost. » Costs and risks well understood.	» Depending on the number of bins and design and location of bin store and collection arrangements, considerable time may be required for facilities management to transfer and return bins to/from collection point and keeping area and bins clean. » Health and safety risk from need to manoeuvre substantial number of heavy bulk bins between storage area and collection point. » Substantial number of bulk bins being moved across public realm for collection and being left in designated collection points can pose risk to pedestrians and traffic
Maximising Recycling	» Generally, system is well understood by public and is simple	» Conventional systems historically generate poor recycling performance in London » The system relies on residents to transfer recycling waste from home to external storage area and deposit in correct communal bins. Location of bin store is important to maximise convenience for residents on way to / from usual daily routes. » Difficult to control/prevent residents placing materials in wrong containers leading to contamination. » Lack of ownership by individual residents / households due to communal nature of bin provision. » If DMR bins become full, DMR may be put in residual bins resulting in lower recycling rates. » Unless intensively monitored and regularly kept clean, can be subject waste spills within or near storage area and attract additional small-scale dumping / fly-tipping and vermin with negative visual amenity impacts.

Table 5.4: Analysis of compactors and smart technologies

System Options	Description	Relative Considerations	Requirements
Bin Compaction	» Bin compactors located within each bin store operated by facilities management are used to reduce the volume of waste within a wheeled bin. These are generally small fixed units located within the bin store area.	» Reduces the number of bins and subsequent space required for waste management across the development. » Space requirements are typically 1.5–1.75x wheeled bin footprint (excluding any additional space required for confinement).	» Bin compactors to be inaccessible to residents e.g. locked cage. » Compaction ratios of no greater that 1:2 for recycling and 1:4 for refuse to be used. Food waste should not be compacted. » Trained facilities manager required to ensure system is properly and safely used.
Skip Compactors	» Wheeled bins are transported to a central collection point where material is transferred to a compactor skip unit by facilities management staff.	» Potential to significantly reduce number of bins required and subsequent storage within each building but would require additional central stage facility and alternative collection vehicles.	» Additional central waste storage facility with sufficient space to accommodate at least one week's waste storage. » Compaction ratios of no greater that 1:2 for recycling and » 1:4 for refuse to be used. Food waste should not be compacted. » Sufficient facilities management staff to manage transfer of wheeled bin.
Bin-fill telemetry	» Bin fill sensors can be fitted to monitor when a wheeled bin is full and requires collection.	» This can have some benefit to facilities management to monitor specific misuse issues. Where appropriate, full bins can be secured when full to prevent overfill. » Can be used to inform WCA of collection needs. » These systems are expensive and can be installed without being well used. It is currently easier to manage crews to operate standard rather than flexible rounds	» Bin sensors adequately fixed to avoid issues with sensors being dislodged. Good integration with staff and systems at the next stage in the collection cycle is essential to realise the potential value in this system.
CCTV Installation	» CCTV system can be used (and publicised) to monitor residents' use of bins, correct segregation of waste, controlling for dumping of waste etc. and prevention of fly tipping	» Can be used as an effective monitoring and enforcement tool.	» Requires investment in facilities management

UNDERGROUND AND PNEUMATIC WASTE COLLECTION DEPOSITS

5.21. In some high density developments where space in buildings or the public realm is limited, alternative storage facilities are being provided. They can be carefully integrated into the public realm or within a building envelope to minimise intrusion and impact on visual amenity and movement.

5.22. Residents are usually responsible for transferring recycling and waste to these deposit points. The deposit point must be located within 30ms of a unit or a means to transfer waste from an intermediate deposit to the collector should be provided.

5.23. These non-conventional systems typically require alternative collection methods. An example of an underground waste collection system can be seen in figure 5.7. For underground storage systems special trucks with mounted cranes may be needed for example.

5.24. A pnuematic system is illustrated in figure 5.8. In these systems, a network of pipes is required that need to be carefully coordinated with other utilities and ground works. The provision of these facilities will have to be agreed with the collection authority.

5.25. Typically the capital cost for these systems is higher than for conventional stores but the operating costs are lower. Some suppliers of these systems will lease or provide finance to cover capital costs that can be recovered through savings from operations. In addition, lorry movements can be reduced in some systems and on-site management is generally much easier.

5.26. It is unlikely that these systems will be provided across all areas within the OPDC development area but their use may be appropriate in some areas.

Principle W5: Underground And Pneumatic Waste Collection Deposits

Requirements for non-preclusion of underground and pneumatic waste collection deposits are:

a) Waste and recycling deposit points should be sited in convenient locations to allow for residents to easily access the collection points on the way to and from the building as part of normal day to day activity (i.e. avoid locating where residents must make a special trip).
b) Deposit points for all material streams should be clustered together to allow residents to dispose of all waste streams at one location.
c) Siting and design should consider mitigation of noise and odour.
d) Clear, consistent and multi-lingual signage should be provided to indicate recycling and waste segregation requirements with colour coding consistent with that used within the home and elsewhere within development.
e) Consider providing secure access to prevent use by non-residents. Use of ID-cards and fobs are common.
f) Keep areas clean and maintain facilities to a high standard.

5.27. A brief description and analysis of the underground and automated system is provided in Table 5.5.

Underground and Pneumatic Waste Collection: Good Practice

Tower Hamlets (bottom) and Wembley Park (top) have both adopted underground or pneumatic systems with deposit points located in the public realm. They demonstrate clear labelling and consistent colour schemes with the rest of the development. Deposit points are clustered together and conveniently located for resident use.

Figure 5.5. Pneumatic waste collection system

Figure 5.6. Underground waste collection system

Figure 5.7. Underground waste collection system

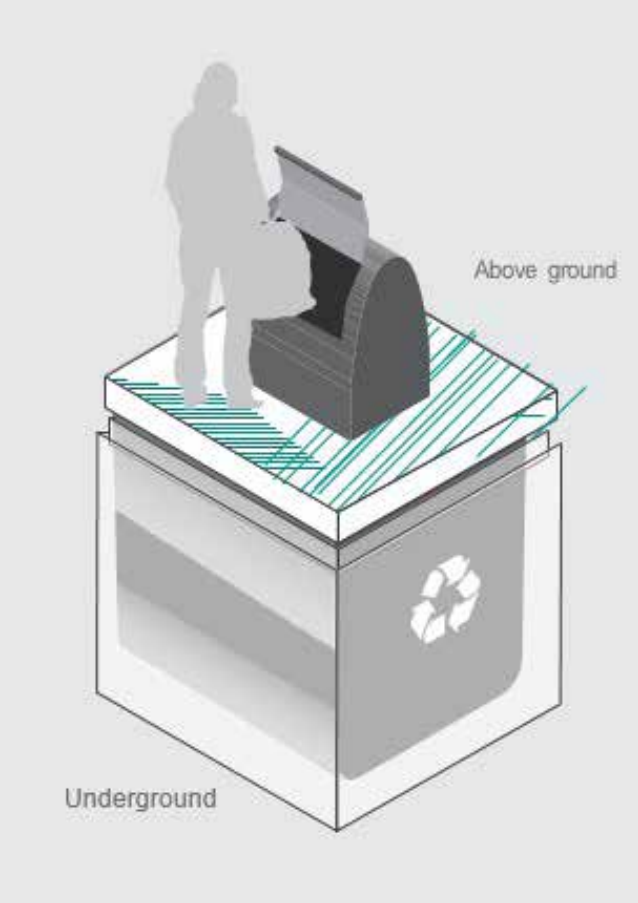


Figure 5.8. Diagram of Pneumatic Waste Collection System

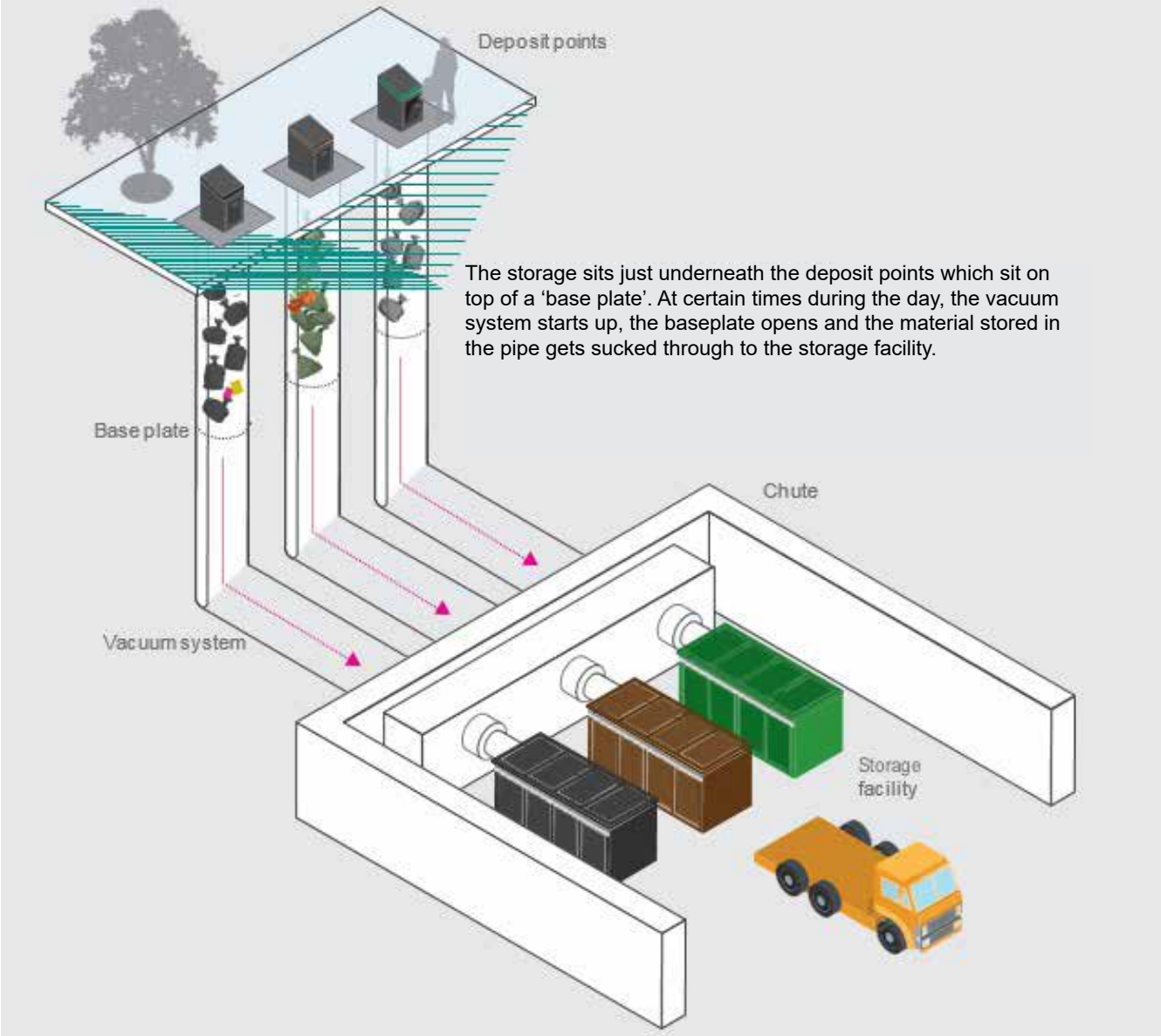


Table 5.5: Description of Underground and Automated Waste Collection Systems

System Options	Description	Relative Considerations	Requirements
Underground Waste Collection	» Above ground deposit points feed directly into large underground storage containers (typically 5000l). Requires a specially designed/modified collection vehicle. » Telemetry can be used to monitor bin-fill and collection.	» Capital costs not too high. » Underground containers are fairly small and therefore may require high number of deposit points and lorry movements. » Potential for odour issues in food waste bins. » Visual and space impact on public realm is greatly reduced freeing up space for alternative uses	» Must be accessible from a serviceable highway.
Automated Waste Collection	» Above ground deposit points feed directly into large underground storage containers (typically 5000l). A specially designed or modified collection vehicle collected waste collects material. » There is a further option to install bin-fill telemetry to aid monitoring and collection.	» The capital costs are typically higher than for conventional systems. However, suppliers are potentially willing to finance the capital costs and recover these through the operating costs which are typically lower than conventional systems. » It is difficult to retrofit this system into » a development and reconfigure to accommodate changes in WCA collection systems. » Minimal risk of odour at deposit points. » Visual and space impact is greatly reduced. » Vehicle movements around the development are greatly reduced as waste is collected and processed in a central site (usually off-site) up to 2kms away from development ideally in a location that is chosen to minimise impact from vehicle movements. » Subject to educating users, they can increase recycling rates in high density developments.	» Space for a central store/processing and collection area up to 2kms from development. » Early commitment, service and utility coordination and dedicated routes for pipework.

SMART TECHNOLOGY

5.28. Smart bin technology such as access fobs and electronic data recording systems are increasingly considered in high density development to support waste management. Whist relatively new, there is potential to improve performance though monitoring of non-compliance and to aid communication and resident engagement.

Principle W6: Smart Technology

Bin fill sensors can also be used to improve waste collection efficiency. Developers and management should consider the following:

a) Smart bin technology is generally easier to install during initial development than to retrofit;
b) smart technologies and user guidance and information is also generally easier to convey to residents as they move into a new development as opposed to communicating its introduction once a resident community is established;
c) the complexity of a system for users' needs to be considered, especially where resident turnover may be high. Useful information and guidance should be provided to new residents;
d) it is not sufficient to specify, purchase and install technology. To be effective, there needs to be a clear strategy for how this technology will be monitored and used;
e) facilities management staff should have a clear remit to use information to inform communication campaigns and there should be clarity regarding where the funding to support this will come from;
f) careful consideration should be given about what technologies to adopt and how to use them. There are many examples where technology has been purchased and deployed but not used. For instance, a lot of the UK's low-rise household wheelie bins have RFID tags to allow resident usage patterns to be monitored, but there are no cases where this information has been successfully used.

Case study: Smart bins in Slough

In 2016 Slough Borough Council and its environmental services provider Amey started trialling 'smart' recycling bins, shown in Figure 5.9 below. The aim was to prevent contamination. The bin is unlocked by the user's electronic key fob, and access is restricted to residents.

Having a lockable recycling container reduces 'casual' contamination by non-residents.

Figure 5.9. Smart Bins, Slough

Case study: Smart bins in Porto, Portugal

Figure 5.10 shows a trial 'pay as you throw' (PAYT) system in Porto, Portugal. Whilst PAYT is not currently permitted for residential waste in the UK, there are opportunities to replicate this technology for commercial waste though a consolidated business approach.

In this example each user has a key card and can only access the recycling or residual containers by presenting the key card. The data management system automatically bills each user dependent upon the number of times the residual waste container is opened. The technology is starting to be developed and trailed for use in a residential setting with data being used for enforcement and campaign targeting rather than charging.

Figure 5.10. Smart Bins, Porto

6 Guidance on User Engagement

USER ENGAGEMENT

6.1. The way residents and businesses use waste facilities is a key consideration in the design of an effective waste management service and will have a significant impact on recycling performance.

6.2. Waste facilities in high-density developments where systems are shared, are very prone to being misused unless smart systems or other means to track waste disposal are used. Communal waste systems in high density developments are also often more complicated to use and constrained by space and access.

6.3. The issue can be further exacerbated where there are too few bins or bins need to be moved around so that full bins are replaced with empty bins on a regular basis. Where bins are full residents often dump waste within a store.

6.4. When systems are misused they discourage other tenants from taking care of the facilities and the anonymity associated with the use of communal systems can result in further decline.

Principle W7: User Engagement

User instructions

a) Users need to be clearly informed as to how to use the service that is provided. This includes what waste materials go where and how they should be presented. Instructions should be made available within the residential unit. Each time a new resident occupies a unit they should be provided with clear instructions and ideally a face to face induction. Depending on the waste management arrangements, user instructions may need to be tailored 'block by block' and include details of:
b) The location of bin store areas/chutes etc. (potentially including a map of the location of the bin store if it is located outside of the building / within a service area;
c) Materials that are accepted and not accepted in each type of bin;
d) Any keys or codes needed to access these; and
e) Arrangements for depositing of any bulky waste.

Signage and iconography

f) Signage in and around container storage areas and within residential buildings should follow the Recycle for London campaign, which is supported by the GLA. The campaign provides information on signage for all types of development. The style and iconography are widely recognised.
g) The Recycle for London (RfL) brand guidelines were refreshed in 2015 alongside the national Recycle Now Campaign and provide an element of flexibility in how these can be used and applied. Artwork and images can be freely downloaded from the Recycle Now Partners website.
h) Developers should work with the waste collection authority to ensure that signage complies with local authority or area based campaigns. As a minimum all signs should:
i) be constructed from a durable material such as metal or rigid plastic;
j) be clear and use icons and images rather than words (English may not be the first language for some residents);
k) be appropriately located on or above waste/recycling containers, on the door of a container storage area etc.;
l) include information about food waste.

New resident engagement

m) To ensure the waste and recycling systems are used effectively all new residents needs to know how to use the system. The challenge facing developers is that properties can be owner occupied, rented by a private landlord or rented through a Registered Provider. It is important to consider how best to engage with each group of residents. As a minimum the following should be provided:
n) clear user instruction as part of a resident welcome pack (in alternative languages where appropriate);
o) clear posters and signage close to waste deposit and storage areas (including chutes where applicable), within hallways, communal areas, and lifts;
p) clear user instructions on the property website (if applicable); and
q) engagement by site management / facilities management staff.

Case Study: User Instructions

London Borough of Hammersmith and Fulham's leaflets shown in Figure 6.2 introduce the new service, explain what can and cannot be recycled as well as how to use the scheme. There are also some FAQs and sources of further information. These materials use very simple, clear and bold design with appropriate use of graphics and iconography.

The leaflet shown in Figure 6.1 uses lots of imagery and few words as the audience may be multi-cultural. It provides detailed information on what goes in each bin, how to recycle, where the nearest bins are (and what they look like) as well as information on bulky waste.

Figure 6.2. Information Signage, Hammersmith and Fulham Council

Figure 6.1. Example of good practice in waste signage

ENFORCEMENT

6.5. No matter how well a system is designed and operated, there will inevitably be issues with usage by residents (both accidental and deliberate). This can result in contamination of recycling and/or loss of recyclable materials within the residual waste stream. The cost to the developer/management companies, the local authority and residents to clean up and provide additional collections can be considerable.

Principle W8: Enforcement

Developers/facilities management should:

a) engage with the relevant waste collection authority to ensure that the right processes are in place to support the effective enforcement of the service. This may include investigation of fly tipping etc. or segregation of waste for inspection by a trained officer; and

b) ensure compliance with the waste management system provided. Correct segregation of waste and recycling materials should be included as a specific condition of any lease, sub-lease or tenancy agreement. Penalising people who do not comply by charging for any costs incurred could be considered.

7 Calculating Waste Arisings

7.1. Guidelines are provided below to help developers calculate space requirements for residential and commercial waste.

7.2. Whilst it is relatively straightforward to calculate residential waste, it is more difficult to estimate how much commercial waste will be generated and therefore how much space is needed until the range of non-residential occupants has been determined. Rough estimates should be made as early as possible to ensure sufficient space is set aside.

7.3. RROWPs should include details of the amount of waste the scheme is expected to generate, how waste will be transferred from the residential/non-residential unit to the collection point and frequency of collection. The approach should ensure that good access is provided including for any vehicles that may be required to tow bins and to clean and maintain stores.

Calculating waste capacity requirements for residential development

7.4. Applicants should calculate the amount of waste that will be generated by waste stream. This calculation should be used to inform the space required to store waste in units, communal storage areas and collection points.

7.5. To identify the space required for domestic waste applicants will need to calculate:

- the volume of waste generated in the development by waste stream within a block;
- the number of bins required to accept the waste; and
- the space required to store bins ahead of a (weekly) collection.

7.6. The following formula should be used to calculate the space required:

Step 1: calculate the volume of waste arisings in litres using the following formula, which is used by the London Borough of Hammersmith and Fulham to calculate waste arisings:

A x ((BxC)) + 30)

Where:
A = number of dwellings being served by a waste collection point

B = volume of waste arising per bedroom per week by waste stream, which is assumed to be:
i) 10 litres food waste
ii) 32 litres dry mixed recycling (DMR)
iii) 58 litres residual waste

(the breakdown by waste stream is based on the London Environment Strategy assumption that it is possible to recycle 42% of household waste)

C = average number of bedrooms

Step 2: calculate the number of bins required for each material stream using the following formula

Volume of waste arising by stream (litres) ÷ bin volumes (240 litres for food, 1100 litres for dry mixed recycling (DMR), 1100 litres for residual waste)

Step 3: calculate the area required using table 5.1 which sets out bin space required including space to access and manoevre bins

(Number of bins x total area required per bin) + 2.989m^2

Note: for each bin store 2.989m^2 of space is needed to operate the door

Note: the area required assumes a weekly bin collection but where collections are provided on a different schedule by the waste collection authority, this will have to be taken into account in calculating waste areas required for storage.

Table 7.1: Bin Dimension Guidelines

	Bin Size	
	1100l	**240l**
Width (including 150mm between bins)	*1.52m*	*0.727m*
Depth (including 150mm between wall and bin, and 1m operating corridor)	*2.235m*	*2.715m*
Total Area Per Bin	**3.3972m2**	**1.974m2**

Note: A worked example of how to calculate the space required on a generic plot is provided in Appendix 1.

CALCULATING WASTE CAPACITY REQUIREMENTS FOR NON RESIDENTIAL DEVELOPMENT

7.7. The high density, mixed use nature of the development in Old Oak and Park Royal will generate large quantities of commercial waste. Understanding how much space needs to be set aside for waste storage and collection is an important part of the planning and design of mixed use development.

Calculating Non-Residential Waste Storage Space

7.8. To be able to calculate the amount of space required for waste storage, applicants will need to know the number and type of businesses which are being provided for and the frequency of collections. Applicants will need to use the following information to calculate the amount of bin storage space that will be required.

Step 1: Calculate tonnes of waste generated per annum using the following formula:

(Using table 5,2) determine the tonnes of waste generated by the business p.a / material composition.

This provides the tonnes of material by waste stream generated p.a (for each business).

Step 2: calculate the weight of waste generated in Kg of material using the following formula:

Tonnes of material by waste stream per annum / 1000 = material stream kg p.a

Step 3: calculate the litres of waste per annum using the following formula:

material stream Kg p.a x bulk density (see table 5.4) = material stream in litres p.a

nos of bins per annum = material stream in litres / bin capacitty / 52 weeks
(assuming a weekly collection (or agreed collection intervals))

Table 7.2: Waste Arising per Employee (tonnes/annum)

Business Sector	Number of Employees						
	0 - 4	5 - 9	10 - 19	20 - 49	50 - 99	100-249	250+
Retail & wholesale	3.08	17.23	25.37	56.32	137.94	292.42	820.25
Hotels & catering	1.67	14.50	21.87	47.48	92.42	95.64	782.97
Other services (e.g. Office)	1.05	4.27	6.76	25.27	60.50	40.19	416.89

Note:
Data on commercial waste arisings are limited, with the principal source being periodic surveys carried out by Defra. While this data is not perfect, it is the best available starting point for an analysis. The last full-scale survey relates to 2008/09, and was published in 2010.

DEFRA (2010) Survey of Commercial and Industrial Waste Arisings 2010 - Final results, 2010

While the headline results have since been updated, with overall arising falling by almost 20%, the key tables that show the quantity of waste arising in different industries and in businesses of various sizes have not been refreshed. Expected arising have therefore been scaled down from the 2010 results to reflect the reduction in waste that is believed to have occurred in intervening years.

Table 7.3: Typical Composition of Waste by Different Waste Streams

Business Sector	Material Stream			
	Food Waste	Dry Mixed Recyclables	Additional Separate Recyclables	Residual Waste
Accommodation and food service activities	31.9%	24.1%	27.5%	16.4%
Generic Commercial	3.6%	38.0%	30.7%	27.7%

Sources:

- Review of Bulk Densities of Various Materials in Different Containment Systems, WRAP, 2007
- WRAP apportionment tool: http:// www.wrap.org.uk/la-apportionment
- WRAP Material Bulk Densities, January 2010
- https://www.sepa.org.uk/ media/163323/uk-conversion-factors- for-waste.xlsx

Table 7.4: Typical bulk density for different types of waste

Waste Stream	Bulk Density (kg/L)
Residual	0.12
Residual (Low Food)	0.08
Mixed Recycling (with Glass)	0.08
Mixed Recycling (without Glass)	0.07
Food Waste	0.50
Garden Waste	0.32
Paper & Card	0.11
Paper	0.31
Glass	0.46
Cardboard	0.06
Card	0
Metals & Plastics	0.03
Metals	0.04
Steel	0.04
Ferrous Metal	0
Aluminium	0.04
Non-Ferrous Metal	0
Mixed Bottles and Mixed Plastics	0.02
Mixed Plastics Bottles	0.03
Dense Plastic	0
WEEE	0.21
Textiles	0.23

APPENDICES

Appendix 1

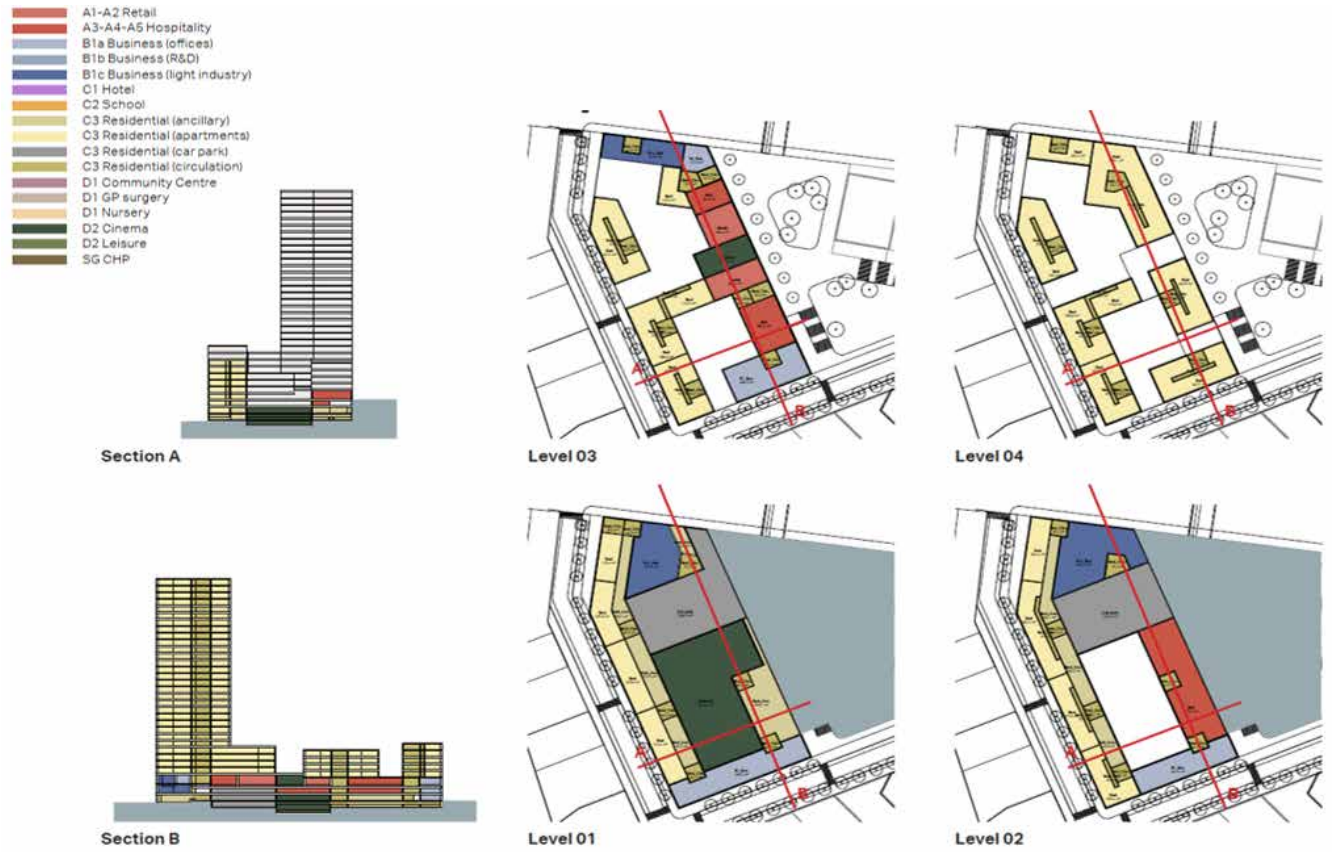
A case study using a Generic High-Density Block

To assist planning applicants understand how to calculate the area needed for waste management an example of approach is set out below using an illustrative high-density block.

Developers are expected to show that a comparable assessment has been undertaken.

The illustrative scheme (figure A.1 below) includes a block with a tall building, shoulder development, podium and non-residential uses on the lower floors. The development will generate a range of residential and non-residential waste streams. Space standards, location of storage and collection points are designed to comply with the waste principles set out above.

Figure A.1: Generic Block Layout



Step 1: Assessing the quantum of waste generated by each core

Table A.1 shows the anticipated waste arising from the illustrative block using the guidance provided in Section 5 above. The tables show the space required for bins within stores and the anticipated waste arisings using the data provided in section 5.

Table A.1 also shows the mix of units and bedrooms per core (see Plan 1 below for core layout). Using the calculation method provided in section 5, the waste arising per core has been calculated together with the number of bins required to serve each core.

Table A.1 Anticipated Waste Arisings from a Typical Block

Core No	Units	Bedrooms	Waste (l)	No. of 1100l Bins
01	28	56	6,440	6
02	207	377	43,910	44
03	24	36	4,320	4
04	30	50	5,900	6
05	30	64	7,300	8
06	37	88	9,910	10
07	52	122	13,760	14
Total	**408**	**793**	**91,540**	**88**

Step 2: Assessing the distances between units and communal bin stores

The blue dashed lines on Plan 1 below show the distance travelled by residents from each unit to the elevator shaft.

The distance travelled from all residential units to a bin store in all cores other than core 2 is greater than 30ms. In some cases, bin stores are up to 90ms from resident apartments. In addition, it is generally considered undesirable to carry waste (especially food) in lifts in tall buildings.

To address these issues a chute system with intermediate waste stores at the bottom of most cores would be proposed except for core number 2. The design now complies with the 30m principle.

In this case study it is estimated that a total of approximately 300m2 would be required to be allocated to bin store facilities. Centralised compactor skip facilities could be incorporated into the development to minimise bin store space and collection vehicle movements but this would need to be designed into the development and require dedicated management capacity.

In this situation a caretaker will be needed to take waste from the intermediate store at the bottom of the cores to the collection point. The stores should be secured and access between the stores and the collection point needs to be designed to provide clear and easy access along a dedicated service route for the facilities team to tow bins between the store and collection points.

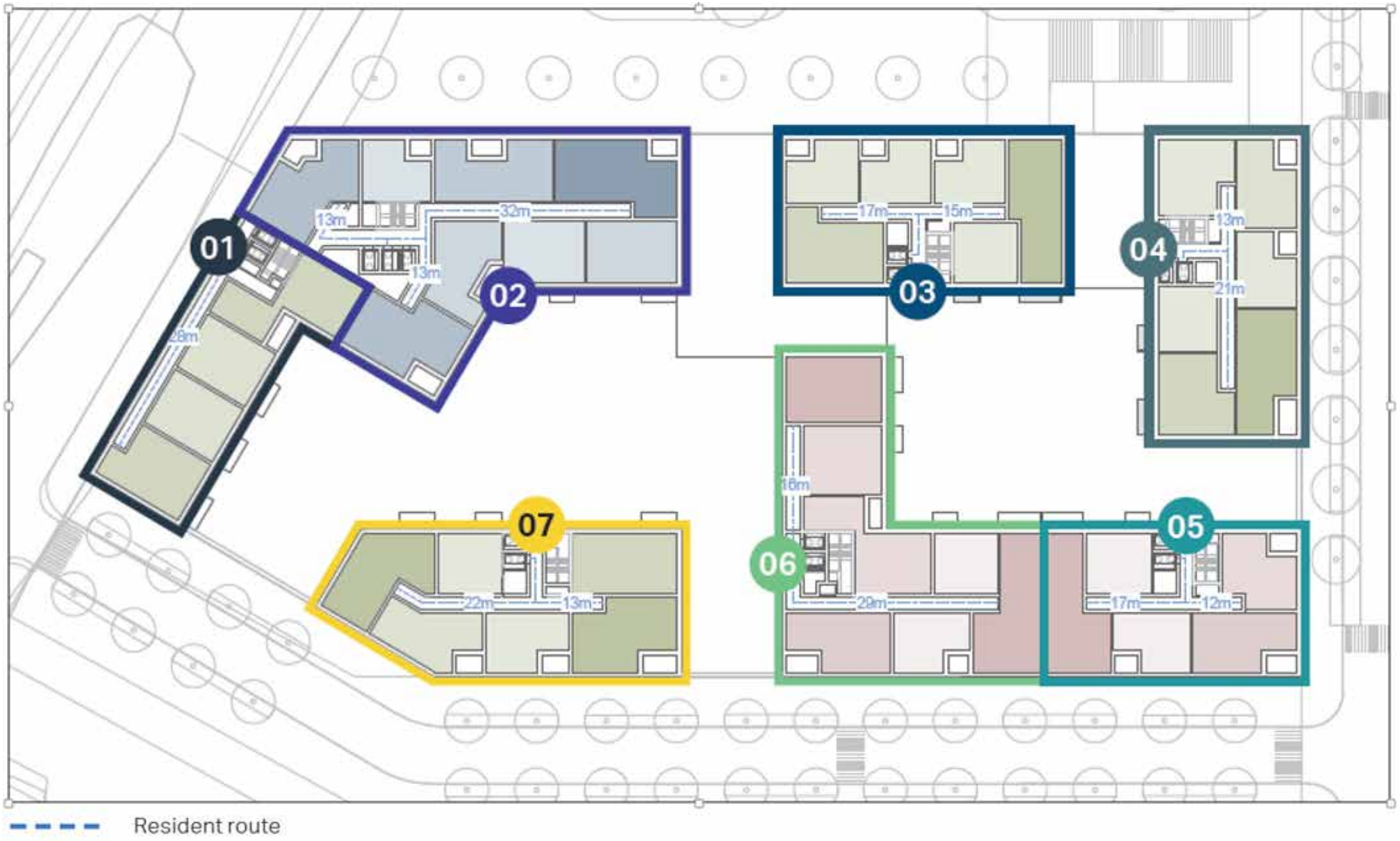
Some of the waste may have to be taken up or down a level so will require a service lift.

Summary of key considerations which need to be addressed include:

- Storage space location – facilities would need to be designed into the building to allow collection and storage of waste at the bottom of the chute.
- Additional shaft space will be required in the core which may impact on the design of lower levels, and the net developable space.
- Storage space size – the size of storage space required at the base of the chute can be reduced to only accommodate ‘in-use’ and ‘spare’ bins. Central storage spaces at the collection point would be required to store bins once full.
- Use of compaction could reduce the overall space required for waste management.
- Good service access to tow bins from intermediate stores to collection points is required.
- Appropriate management capacity would be required to effectively management this system.

Note in this example bin stores are in the public realm, but in general they should be sited in service areas within the building in line with the policy.

Plan 1: Location of building cores with distances travelled (blue dotted line) by residents to the core.



Plan 2: Distances travelled from the core (in orange) to the proposed bin store on levels 00 and 01.

A conventional bin store system adopted in this case, would see bin stores located at the lowest level of each elevator shaft at either level 00 or 01 as shown in Plan 2, due to access being located at different levels depending on topography and street levels across the site. This system would have limited impact on the configuration and space allocation through the levels of the building.

Underground or pneumatic waste collection systems could be used but deposit would in most cases be by facilities management unless a pneumatic collection system was integrated with a chute system. This would simplify transfer of waste, reduce the space needed for bin stores and simplify access requirements for refuse trucks. The cost of the system and complexity may be very challenging and would need to be tested.

Space provided for waste in this case study only takes account of residential waste. Space is also needed for commercial and bulky waste. The approach for calculating space standards for non-residential waste in Section 5 should be used. This can be applied once use of non-residential units has been agreed.

This case study sets out the approach that should be adopted when designing a waste management system in a dense development.

Applicants are advised to consider the challenges and constraints highlighted and demonstrate how they have developed a waste system that will support the Mayor's waste recycling ambitions and provide adequate space for waste management. Applicants will be expected to demonstrate that the systems they propose meet the principles set out in this SPD and have been discussed and agreed with the waste collection authority.

Appendix 2

Relevant London Plan and Local Plan Policies

The GLA has introduced new waste recycling targets within the Draft New London Plan, published for consultation in December 2017.

The key policy in the London Plan that relate to this SPD include:

SI7 Reducing waste and supporting the circular economy

A 4) meet or exceed the municipal waste recycling target of 65 per cent by 2030

Key policies in the Local plan that relate to the SPD

Policy EU6

d) major development proposals will be supported where they demonstrate:

ii) a collaborative approach with the Waste Authorities and OPDC is being positively adopted to help deliver strategic waste management systems in order to meet national and London waste recycling targets;

iii) adequate provision of for waste storage and collection within developments, in accordance with LWARB guidance on recycling and storage, ensuring source segregation of bio-waste and other recyclables; control of odour, nuisance and air and noise pollution for waste storage and collection; and working with relevant Local Authorities to ensure waste collection approaches align with current and future waste collection arrangements.

Appendix 3

Glossary

Term	Definition
AD	AD Anaerobic Digestion. Food waste used to produce digestate and biogas which is converted to electricity.
Bin Store	Central location where material from communal properties is deposited prior to transportation for treatment/disposal.
Bulk Density	The weight of material in a given volume. kg/m3 or kg/L3 commonly used for waste bulk density
Bulking	Consolidation of collected material in a central location (depot or waste transfer station) prior to onward transportation for treatment or disposal.
Bulky Waste	Waste types which are too large to be accepted by the regular waste collection service (e.g. mattresses, furniture).
Communal Waste Arisings	Volume of waste generated by residential properties where waste and recycling services are provided from a communal location (instead of individual self-contained properties).
Contamination (recycling)	Materials within a specific recycling container/ collection which cannot be recycled in that stream. For example – plastic wrappers in a separate food bin, or glass in a paper recycling bin.
Dry Recycling	Can include aluminium, steel, plastics, glass, card and paper. Material can be collected as separate material streams or in combination.
DMR	Dry mixed recycling. A combination of dry recycling materials. This can include aluminium, steel, plastics, glass, card and paper.
FWD	Food Waste Disposers.
GLA	Greater London Authority.
IVC	In-Vessel Composting. Food and garden waste processed to produce a compost-like output soil improver.
LACW	Local Authority Collected Waste.
London's Environment Strategy	Strategy setting out the vision for London's environment in 2050. The strategy includes a target of 65% of London's MSW to be recycled by 2050. Summary available: https://www.london.gov.uk/sites/default/files/draft_environment_strategy_-_executive_summary.pdf
Macerator	A macerator is a waste disposal unit that is combined with a pump, which is used to reduce solid waste to liquid and to pump the waste against gravity. It can be used in kitchen sinks as a way of disposing of food waste.
Material composition	The composition (type and percentage) of material present in a waste stream.
MI	Management Information.
Multi-channel Communication Programmes	The practice of interacting with users in a combination of indirect and direct communication channels.
Municipal Solid Waste / MSW	Black bagged waste and bulky waste. Material collected by local authorities and commercially. It does not include municipal construction and demolition waste.
OPDC	Old Oak and Park Royal Development Corporation.

Term	Definition
Recycling	The reprocessing of materials to re-useable material. Recyclable materials from households and commercial properties can include aluminium, steel, plastics, card, glass, paper and food.
Recycling Rate/ Recycling Performance	The proportion of recyclable material separately collection from MSW/black bag waste.
Recycling Scheme	The method of collecting recycling which the user has separated into specific containers from MSW.
Residual Waste	Black bag waste/MSW.
Three-stream Segregation	An approach to recycling where materials are split into three streams: – Stream 1: DMR; Stream 2: food waste; and Stream 3: residual waste.
Waste Arisings	Total volume of waste from a source (e.g. households, commercial premises).
Waste Management Service	A service that provides waste/recycling collection, recycling, recovery and disposal.
WCA	Waste Collection Authority. Local Government splits responsibility for managing waste between two types of authority. London Borough are typically Waste Collection Authorities (this is the case in LB Hammersmith & Fulham and LB Ealing) but separate Waste Disposal Authorities manage the waste for multiple WCAs once it is collected.
WDA	Waste Disposal Authority. See WCA above.
WEEE	Waste Electrical and Electronic Equipment.
WRAP	Waste and Resources Action Programme.

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