ReLondon

Waste Composition Analysis: A Buyer's Guide

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1. Introduction

Investing in good quality data is crucially important when making sound operational and communication based decisions, and waste composition analysis (WCA) is one way that waste authorities can gather this data. Key operational or strategic decisions made based on poor quality data can have far reaching and costly implications e.g. infrastructure that doesn't suit the waste stream or a communications campaign wrongly targeted.

This guide is for those London waste authorities looking to procure waste composition analysis and takes 'the buyer' (waste authority) through the process from beginning to end to ensure that requirements of the WCA are thoroughly considered to obtain the best possible data. In addition to this, ReLondon is aiming to improve the quality of London-wide data, and developing a more standardised approach will enable this.

Much is known about how to collect robust waste composition data from kerbside properties, however, this is not the case for purpose built flats. This guide attempts for the first time to set out an approach which covers both property types, and ReLondon recommends that all waste authorities in London read and procure WCA in line with this guide. Any waste authority in London considering using this guide can contact ReLondon directly to discuss their requirements.

1.1. Purpose of this guide

This guide is for waste managers from London Boroughs and Waste Disposal Authorities ("Waste Authorities") who are considering conducting a WCA. The purpose of the guide is to help Waste Authorities obtain high quality compositional data, which can be compared and aggregated across London, and includes step by step information on the processes of planning, commissioning, managing and quality assuring a WCA study.

The guide relates to household waste and recycling collected from kerbside properties and purpose built flats, and considers the most common types of WCA, where results are intended to be representative of a whole Borough or waste disposal authority area. This guide does not cover material collected at Household Waste and Recycling Centres (HWRCs), litter, street sweepings or trade waste.

Throughout the document 'suppliers' are referred to, which are the WCA companies that Waste Authorities commission to carry out the sampling, sorting, weighing and reporting involved in a WCA.

1.2. Rationale

This guide does two important things to help Waste Authorities obtain high quality compositional data. Firstly, it explains, step by step, what Authorities need to think about and do at each stage of the WCA process and secondly, it sets out some requirements for suppliers delivering WCA.

Best value will be obtained by making the data collected serve the needs of as many people as possible, however, you should avoid asking your supplier to collect information 'just in case', as this will add cost and complicate the project.

1.3. ReLondon

ReLondon[1] is a partnership of the Mayor of London and London's boroughs to improve waste and resource management in the capital and accelerate the transition to a low carbon circular city. ReLondon's mission is to make London a global leader in sustainable ways to live, work and prosper by revolutionising our relationship with stuff and helping London waste less and reuse, repair, share and recycle more.

[1] More information can be found on ReLondon's website: https://relondon.gov.uk/

2. Understanding WCA

Waste Authorities should take the time to inform themselves about WCA as a measurement technique. This chapter sets out the basics.

2.1. What is WCA for?

WCA is a technique for quantifying the different materials in mixed material. Residual waste and dry mixed recycling (DMR) are good examples of material streams that are mixed. Authorities need to understand the material make-up in order to:

- Assess the performance of waste and recycling services (capture[2], and contamination rates[3])
- Evaluate the success of trials
- Develop new strategies for effectively and efficiently managing waste and recycling
- Provide data in invitations to tender for waste collection and disposal services
- Accurately calculate the biogenic vs anthropogenic carbon split in the residual waste stream, which in turn affects the carbon impact of treating that waste, whether it is destined for landfill or an energy from waste facility.

2.2. What does WCA involve?

WCA involves collecting a representative sample of waste, sorting it into material types and weighing each one to produce an estimate of the overall composition of the mixed material stream. Figure I outlines the standard WCA process.

[2] The proportion of a particular material captured for recycling, out of all of that material that is waste (residual + recycling).
[3] The proportion of non-target materials in the recycling stream.

Figure I Standard WCA process.

Samples of material are collected on the normal day of collection from pre-selected properties. It is recommended that a sample of residual waste is always collected first (prior to the collection and analysis of other waste streams), and that ideally, samples are collected from two different seasons.

It is recommended that this is carried out by the supplier, however, other approaches include the Waste Authority collecting the waste in a dedicated non-compacting vehicle for the supplier to sort (this is often used for purpose built flats) or suppliers taking a bulk sample at a waste facility, such as a transfer station or Materials Recycling Facility (MRF).

2.3. Who supplies WCA?

WCA requires both statistical and operational expertise. The desk-based property selection, data analysis and reporting elements of a WCA may in principle be carried out by suitably skilled waste authority officers. However, the operational elements must be carried out by waste professionals as they will ensure staff are suitably trained and appropriately protected from the hazards associated with the waste and the working environment. In practice, most Waste Authorities procure the whole package (including both the operational and desk based elements) from a specialist supplier.

3. Clarifying your needs

Even if you are very certain about your data needs, it is always worth taking a step back to confirm them. Taking the time to document who needs what, why and when can help you make better decisions as you move through the process of commissioning a WCA.

3.1. What do you need to know?

Before starting the commissioning process, make sure you know what information your Waste Authority really needs. Ask yourself 'what do we need to know that we don't know now?' and 'why do we need to know it?' This will help clarify what the knowledge gaps are. A structured way of approaching this is to use the 4Ws framework – **what** do we need, **who** needs it, **why** do they need it, and **when** do they need it. An example of a completed 4Ws table is shown below.

Table 1 Example of What, Who, Why and When (4Ws) table

What do we want to know? At what level of detail?	Who wants to know this?	Why do they want to know?	When do they need to know by?
What are the key differences (in terms of materials being placed into the recycling bin), between the different demographic sectors within the local authority area	Waste strategy manager	To enable us to focus specific communications campaigns on areas where different demographic sectors are prevalent.	The budget for campaigns is set in November, so in order to inform this, we need to know this information by September.
What is the typical amount (kg per household per week) of textiles in the residual waste, and what kind of things are they (clothes, shoes, belts etc.)?	Collection contract manager	Textiles are not collected in the existing kerbside service. We have been considering whether to add them, so this information will help us understand the arisings there is likely to be from each household and therefore what kind of container we need to provide, if any. This will help us write a business case.	The business case has to be finalised by 31 August to allow time for it to feed into the budget-setting process. The information must be available by 1 August.

What proportion of residual waste is made up of 10 key materials – paper, cardboard, plastic film/flexibles, dense plastic, glass, ferrous metal, non-ferrous metal, textiles, food, garden waste?	Authority waste strategy manager Waste Disposal Authority (WDA)	We are producing a report for members on the effectiveness of our service for the purposes of EPR funding.	Members need to be informed prior to the allocation of the first round of EPR funding in December 2025, so data needs to be available 6 months prior to this.
How much edible (avoidable) food is being thrown away by households, and what is the main type?	Sustainability Team GLA food waste prevention lead	We want to run a campaign to reduce the amount of edible (avoidable) food ending up in the residual waste. Headline data only.	Data is needed in November to prepare for a Christmas communication campaign highlighting wasteful buying and food sharing.

By documenting colleagues' needs you can make sure the specification for commissioning is clear and focused, and only asks for what is needed. Future needs are as important as current needs, for example if contracts are soon to be re-let, or if legislative changes are coming. The needs of departments other than the waste department should also be taken into account, alongside those of other statutory organisations such as the Waste Disposal Authority (WDA).

3.2. What approaches can you take?

First, check what information you already have. Data that is only a couple of years old can still be valid if there have been no significant changes to services, area characteristics or the material composition of products and packaging placed on the market[4].

However, also consider whether you need to know information about the composition within different geographical areas and/or other demographic factors, such as those determined by the London Output Area Classification (LOAC) (see section 5.1), if you do, then a waste composition analysis (using LOAC) will be required.

If you don't already have the information you require and need to gather new data, then the first step is to think about how reliable you need the information to be. WCA produces the most reliable data, whereas other quicker and cheaper methods will produce less reliable data. If the outcome you want needs to be precise, (e.g. food waste is 20% not 15% or 25%), a WCA will be required. If you need less precise information (e.g. there is a lot of food waste in mixed waste) then an approximate estimate may be good enough. Four alternative approaches to a full WCA are set out below along with circumstances in which they might be appropriate or inappropriate:

[4] Specific consideration is needed on the effects the Covid-19 pandemic had on waste composition. In this respect, consider the dates of any previous WCA that has been carried out.

Table 2 Alternative approaches to a full WCA

Approach	Example	Suitable for …	Unsuitable for …
Visual assessment of volume	Visiting the tipping hall of a transfer station, MRF or treatment site and estimating the proportion of a particular material by looking at several different collections over several different days	• Generating a rough estimate • Commonly occurring materials or items • Easily visible materials or items • Estimating volume rather than weight	• Characterising the whole waste stream • Bagged waste
MRF composition reports	Information on the composition and contamination in dry mixed recycling is available through the regular reports received from your MRF	• Percentages of different materials • Levels of contamination	• Characterising the whole waste stream (as the sample is very small) • Characterising the waste by LOAC
Eliciting expert opinion	Asking the supervisor or the sorting team at the MRF for their estimate of the typical proportion of different recyclable materials since they deal with that recycling stream all day long	• Generating a rough estimate • Commonly occurring materials or items • Easily visible materials or items • Estimating volume or instances, not weight	• Characterising the whole waste stream
Transposing someone else's data	Taking recent waste composition analysis data from a similar neighbouring authority with similar collection services, or national data from WRAP or Defra, and applying results to your own area by weighting them according to your population and demographics	• There is enough similarity of collection services and demographics between your area and the area represented by the other data • The data is not too old	• Areas that have unusual services or circumstances

3.3. Next steps

Figure 2 on the next page will help guide you through the process of deciding how best to get information on waste composition. If you decide that a WCA is the best approach, the rest of this document takes you step by step through the process.

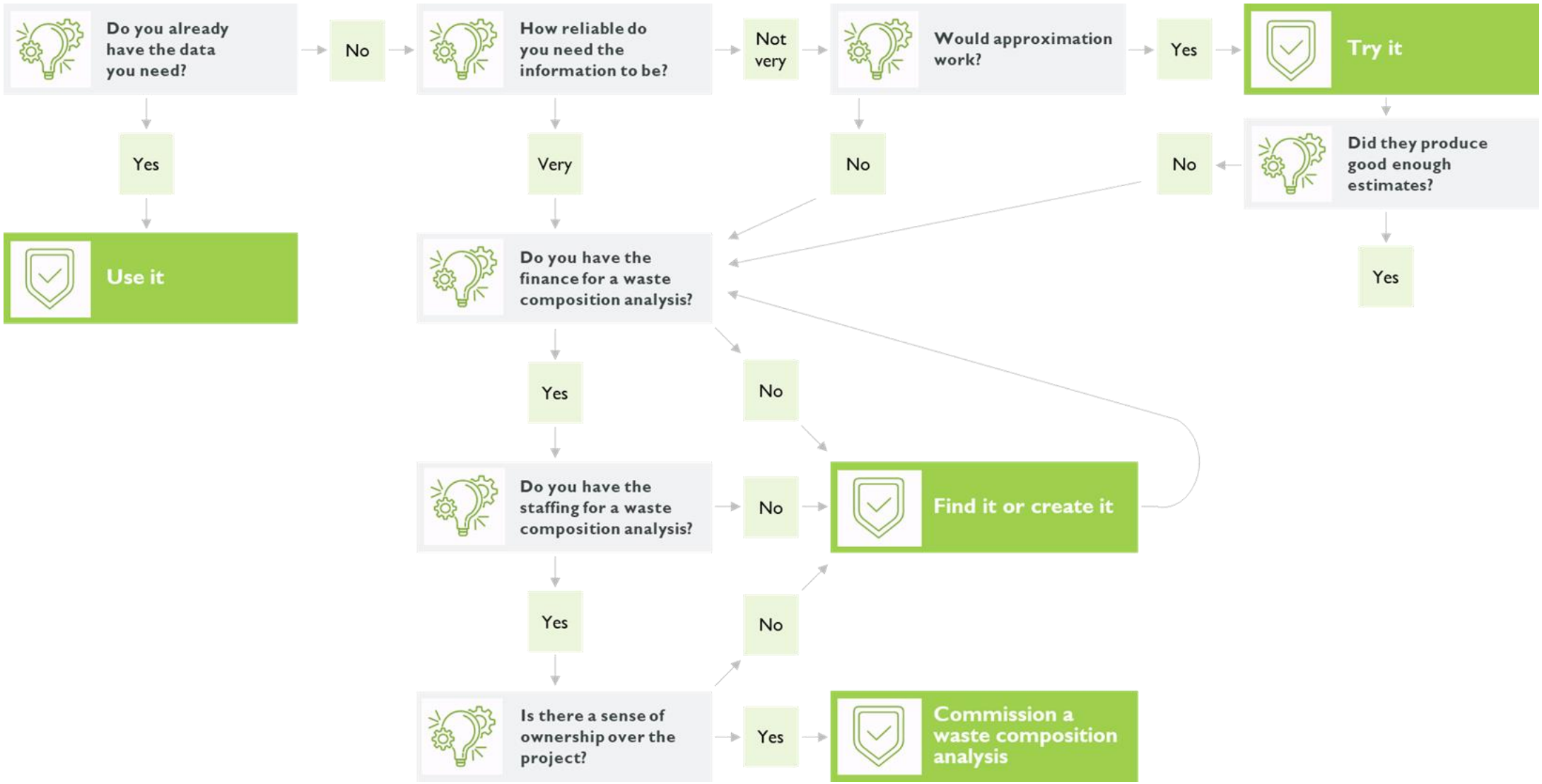

Figure 2 Decide how to get the data you need: a flow chart to help decision making

4. Planning and preparing

Before writing your specification for a WCA, you need to do some planning and preparatory work.

4.1. What should be included?

Your choice of which services the WCA should cover should initially be guided by your 4Ws table (see section 3.1).

- Single material waste streams, (such as separately collected food waste), do not necessarily need to be included in waste composition analysis studies, unless there is a need to understand more about the characteristics of the waste, for example, the quantities of edible and inedible fractions for food.
- Information on the composition and contamination in dry mixed recycling may be available from the MRF, however, if you want to determine the composition by LOAC (see section 5.1) then this would still need to be included.
- If you want to get reliable information on capture rates there may be merit in including all waste streams.

4.2. Which geographical areas need to be included?

Once you are clear which services you need to include, you should think about the geographical coverage implied by what you need to know. Do certain rounds need to be included (e.g. a need to understand high levels of contamination in certain areas)? Does the whole Authority need to be covered (e.g. understanding the composition of household waste as a whole)?

4.3. Do you need to understand composition in relation to the geodemographics?

Geodemographic systems are useful for WCA as the composition of waste is driven in large part by the characteristics of the household producing it. It is recommended that if you want to take this approach that you use the LOAC (see section 5.1), as unlike other classification tools it is free to use.

4.4. Which categories of waste do you want to include?

You need to specify which categories of waste you want to know about. ReLondon has developed a London Waste Category List (LWCL) to help structure your choices, see Table 3. The list was developed in partnership with waste authorities, regional and national organisations and suppliers.

By developing this list, the aim is that all London Boroughs use the same materials options, therefore providing better standardisation and enabling waste authorities to make comparisons with other authorities across London.

The list has three levels, and using these will ensure that data from all WCAs in London can be compared and aggregated, adding immense value to the data. The three levels are:

- **Level 1: Main material type**
- **Level 2: Type of material or item**
- **Level 3*: Recyclable or non recyclable**

*Level 3 of the London Waste Category List relates to recyclability and is defined in line with the MF Regulations[5].

Recyclable – target (RT)	A material that is identified by the operator of a materials facility as destined to be separated out from mixed waste material in order to produce bulk quantities of that identified material
Recyclable – non-target (RN)	Material that is capable of being recycled (i.e. the materials are sent for recycling) but is not a target material
Non-recyclable (NR)	Waste material that is not capable of being recycled (i.e. it cannot be sold for recycling and must be disposed of as a waste, or sent for further processing)

You should prepare your category lists, one for each of the streams that you are including in your waste composition analysis, prior to the commissioning, to include them as annexes in the specification. The template LWCL is shown below in Table 3.

[5] Schedule 9A (Materials Facilities) of the Environmental Permitting (England and Wales) (Amendment) Regulations 2014

Table 3 The London Waste Category List (Version 1.0, November 2020)

LEVEL 1 MATERIAL		LEVEL 2 TYPE OF ITEM		LEVEL 3 RECYCLABILITY		
				RT	RN	NR
1	Paper	1.1	Paper packaging			
		1.2	Non-packaging paper			
2	Cardboard	2.1	Card packaging			
		2.2	Cartons and card/plastic laminates			
		2.3	Non-packaging card			
3	Plastic films and flexibles	3.1	Plastic film – packaging			
		3.2	Plastic film – non-packaging			
		3.3	Single use carrier bags			
		3.4	Plastic/foil laminates			
		3.5	Compostable flexible packaging			
4	Dense plastic	4.1	HDPE bottles			
		4.2	PET bottles (drinks)			
		4.3	PET bottles (non drinks)			
		4.4	Other plastic bottles			
		4.5	Pots, tubs and trays			
		4.6	Non-packaging plastic			
5	Glass	5.1	Container glass (e.g. bottles, jars)			
		5.2	Non-container glass			
6	Ferrous metal	6.1	Drinks cans			
		6.2	Aerosols and gas canisters			
		6.3	Other ferrous packaging			
		6.4	Other non-packaging ferrous metal			
7	Non-ferrous metal	7.1	Drinks cans			
		7.2	Aerosols			
		7.3	Foil packaging			
		7.4	Non-packaging foil			
		7.5	Other non-ferrous packaging			
		7.6	Other non-packaging non-ferrous metal			
8	Textiles	8.1	Clothing			
		8.2	Shoes, bags, belts and other textile accessories			
		8.3	Non-clothing fabric and textiles inc. soft furnishings			
9	Food and drink	9.1	Food and drink (edible/avoidable) – in packaging			
		9.2	Food (edible/avoidable) – loose in the bin			
		9.3	Associated inedible parts of food (unavoidable)			

LEVEL 1 MATERIAL		LEVEL 2 TYPE OF ITEM		LEVEL 3 RECYCLABILITY		
				RT	RN	NR
		9.4	Cooking oil (in packaging but where oil is the bulk of the weight)			
10	Garden waste	10.1	Mowing, cutting and pruning waste (green or woody garden waste)			
11	Wood	11.1	Wooden packaging			
		11.2	Non-packaging wood			
12	Inorganic materials	12.1	Rock, stone, rubble and other non-organics			
		12.2	Plasterboard			
		12.3	Soil			
		12.4	Ceramics and pottery			
13	Electrical and electronic items and associated parts	13.1	Small domestic appliances			
		13.2	Cables and chargers			
		13.3	Batteries			
		13.4	Light bulbs and tubes			
		13.5	Ink and toner cartridges			
		13.6	Gas canisters			
		13.7	Other WEEE and associated consumables			
14	Other	14.1	Incontinence pads			
		14.2	Other absorbent hygiene products			
		14.3	Healthcare wastes			
		14.4	Pet excrement and cat litter			
		14.5	Synthetic and natural rubber items (e.g. condoms, rubber bands)			
		14.6	Other			
15	Fines	15.1	Sorting residues less than 10cm ('fines')			
16	DRS materials	16.1	Totals of 4.2 + 6.1			

4.5. Can you offer suppliers a site for sorting waste?

Financially and environmentally, it is best to carry out the sorting and weighing element of WCA at local sites ("sort site"). You need to know, before the procurement starts, whether you will be able to provide such a sort site as this will be one of the first questions potential suppliers will ask you. Requirements for the sorting site will differ from supplier to supplier, but as a guide you would need it to:

- Provide a minimum of 20x20m of space for sorting
- Be under cover and ideally sheltered on all sides
- Be on a hard standing
- Be accessible with a van and (if your WCA includes samples taken from purpose-built flats) with an RCV, with enough head height for the RCV to safely tip the waste within the sort area
- Be well-lit and free of, or adequately protected from, vehicle movements.
- Have access to welfare facilities including a toilet and hand washing facilities (although it may be possible to provide this in the form of a temporary mobile welfare unit)

If you do not have a suitable sorting site, you should ask waste contractors and neighbouring authorities whether they have one they could offer.

There are a number of reasons why it is preferable for the waste authority to provide the sort site. Firstly, you are likely to have access to sites that are already handling waste; these are ideal because they have the relevant permits in place, are accessible to large vehicles, are secure overnight, and the sorted waste can be easily placed ready for recycling or disposal. Secondly, you may be able to use them free of charge or at a preferential rate; third party sites can be costly. Thirdly, you have the local knowledge to find a site close to the centre of the WCA area which minimises unproductive travel time and reduces the number of teams needed by the supplier, all of which will add cost.

If you have been able to find a site, you should provide as much detail as possible in the specification. If you cannot identify a suitable site, the specification should state that suppliers will need to cost for finding and using a sort site.

4.6. Can you offer suppliers help to collect waste from purpose built flats?

Purpose built flats need special consideration because some have large containers (>360l) that cannot be collected with the manual tipping approach used for kerbside samples. Collecting from purpose built flats may involve suppliers:

- Using a council/contractor RCV; the supplier may ask the Waste Authority to make a vehicle and crew available for this
- Hiring an RCV and driver, at additional cost to the project and with requirements for overnight safe parking to be provided
- Using oversized bin bags in containers which can be manually removed from communal bins. The regular crews would be required to fit the first of these bags.

The first option is preferable financially and operationally, and you should state in the specification whether you will be able to provide a vehicle and crew for this purpose.

4.7. Who will select the properties?

The properties to be included in the analysis can be selected by either the supplier or the buyer, and different approaches are required for selecting kerbside properties and flats.

4.7.1. Supplier property selection

If the supplier is going to be selecting the properties for sampling, you will need to provide them with the following information from round lists - for both kerbside properties and purpose built flats, across the whole borough:

- Address with postcode
- Waste streams collected
- Normal collection frequency and collection day for each stream
- Size and type of receptacle for each stream

In addition, the information required for purpose built flats also needs to include:

- Name of the building or estate
- Number of blocks, if relevant
- Total number of properties
- Number and types of bin stores (e.g. near entry, basement)
- Number of containers in each bin store for each material
- Collection times and days

It is important to provide the supplier with as much information as possible in order for them to be able to make the most representative selection. If you do not have all of this information, provide what you have to your supplier, but consider attempting to gather this information prior to commissioning a waste composition analysis, in order to make the process as robust as possible.

Once the contract starts, the supplier may request additional information, for example regarding access arrangements and contamination policies. You may wish to collate this at the same time as the information needed for the specification, to create a resource that can be used for other purposes.

4.7.2. Buyer property selection

As the buyer, you may decide yourself to select the properties from which waste is to be collected. The possible advantages and disadvantages of this are set out below:

Advantages

- Creates greater ownership and control over the way the project is designed
- Allows suppliers to cost work more accurately so bids can be more fairly compared
- Creates an opportunity for staff learning and development
- Saves on the cost of the supplier doing the selection (although these costs are minimal)

Disadvantages

- Takes time away from the day job
- Requires an understanding of sampling and the practical consequences of decisions, without which mistakes might be made
- Requires access to someone with spreadsheet software skills (e.g. Microsoft Excel)
- Local knowledge could lead to a biased sample, unless care is taken to avoid it

Appendix A takes you through the process of how buyers can carry out the property selection for kerbside properties and purpose built flats.

Of the two options, it is recommended that where possible, the supplier should carry out the property selection, as specific and advanced spreadsheet software skills are required.

4.8. Will you inform the selected households about the study?

The best quality data is likely to be obtained by not informing the selected households that their waste is to be analysed. This is because householders may temporarily change the things they throw away or become more diligent about recycling, which will distort the results. It is therefore recommended that the selected households are not specifically informed, although there is no reason why the study as a whole should not be made public.

For some Waste Authorities, perceived ethical considerations may outweigh the data quality risks and they may decide that the selected households should be informed and given the opportunity to opt out. Every Waste Authority will need to make their own decision and set it out in the specification so suppliers can cost up the implications. The pros and cons are outlined below.

Advantages

- Ethical considerations
- Elected Members may be more supportive if they think their electorate have been given a choice about taking part
- If there is negative media interest, there is less likelihood of it escalating if you can tell journalists that the selected households were not only informed but also allowed to opt out
- If done well in advance, most residents will forget about the study and resume their normal behaviours

Disadvantages

- Adds a number of tasks to the programme, including informing the households once they have been selected, managing opt out lists, and reworking collection schedules as opt outs come in
- May introduce bias if certain types of household are more prone to opting out
- May introduce inaccuracy if households don't opt out but change their behaviour
- May result in mass opt-outs or adverse media attention if the study is misconstrued on local social media groups. This means reworking samples, which could delay the work and introduce bias into the results
- Longer timeline for the project, including a gap of several weeks between informing the sampled households and making the first collection, to allow for opt outs to come in and for behaviour to revert to normal (waiting at least three collection opportunities is standard)
- May make it more difficult to get a representative sample of households

Whichever option you choose, you should ensure that you provide the Supplier with a Letter of Authority written on Council headed paper. This can be shown to any residents who raise concerns about the actions of the Supplier.

5. Property selection

Consider whether you need to know information about the composition within different geographical areas and/or other demographic factors. If you do, then it is recommended that you use the London Output Area Classification (LOAC).

5.1. LOAC

LOAC is an open source geospatial classification tool that uses a combination of over 60 Census variables to classify every single small area in London within a hierarchical structure[6].

The demographic factors taken into account when devising LOAC include:

- Average age
- Living arrangements
- Property type
- Ethnicity
- immigration status
- Proficiency in English
- Presence of children and students
- Tenure
- Level of qualifications
- Vehicle availability
- Travel to work arrangements
- Employment status
- Sector of employment.

The UK is divided into small areas known as 'output areas', which are based on postcodes and most contain between 110 and 140 households. There are more than 25,000 output areas in Greater London.

Each output area in London has been allocated to one of eight LOAC Super Groups and one of 21 LOAC Groups. Groups aggregate up into Super Groups, as shown in Table 4.

[6] More information on LOAC is available here: https://data.london.gov.uk/loac/

Table 4 Table of LOAC super groups and groups

Super Group	Group
A: Intermediate Lifestyles	A1: Struggling suburbs A2: Suburban localities
B: High Density and High Rise Flats	B1: Disadvantaged diaspora B2: Bangladeshi enclaves B3: Students and minority mix
C: Settled Asians	C1: Asian owner occupiers C2: Transport service workers C3: East End Asians C4: Elderly Asians
D: Urban Elites	D1: Educational advantage D2: City central
E: City Vibe	E1: City and student fringe E2: Graduation occupation
F: London Life-Cycle	F1: City enclaves F2: Affluent suburbs
G: Multi-Ethnic Suburbs	G1: Affordable transitions G2: Public sector and service employees
H: Ageing City Fringe	H1: Detached retirement H2: Not quite Home Counties

5.2. Valuations Office Agency (VOA)

Further to this, published data by the VOA on property type, detailing the breakdown of housing types down to Lower Super Output Area (LSOA) is available from the London Datastore[7]. It splits out properties within each LSOA into:

- Bungalows
- Flats & maisonettes
- Houses terraced
- Houses semi
- Houses detached
- Annexe
- Other unknown

[7] https://data.london.gov.uk/dataset/property-build-period-lsoa

5.2.1. LOAC and VOA

The ability to understand the characteristics of an area and its population is crucial to ensuring representative data is produced to allow informed decisions to be made. As affordability means that only a relatively small amount of waste can be sampled, it is essential to ensure that the sampled households reflect the wider population.

Samples should be stratified (sub-divided) according to the characteristics most likely to be driving any differences in waste composition.

It should be noted that the data is approximate as it makes no distinction between flats with a communal entrance and smaller blocks each with their own door, which are more likely to be receiving an individual kerbside collection service than a communal collection service. A further limitation is that the smallest geography level the data is available at is LSOA, rather than Output Area (OA).

This is again, why it is so important for your Borough to ensure that as much information as possible is held within its own departments, in order to add a further level of accuracy to the VOA property data.

The proportion of flats can also be approximated by assessing the LOAC Super Groups found within the Borough. Some LOAC Groups are much more likely to contain flats than others. As a general rule, areas classified as LOAC Super Groups B, D and E are much more likely to contain flats whereas areas classified as Super Groups A, C and H are much less likely to contain flats. Communal living establishments such as sheltered housing and serviced student accommodation are more commonly found in Groups B3, C4, E1 and F2.

6. Writing the specification

This chapter sets out what should be included in the specification. The specification is the section of the invitation to tender which sets out your needs and how you expect them to be met.

This guide suggests a structure, but this can be adapted to work alongside any formal requirements for an invitation to tender your Waste Authority may already have, or your own stylistic preferences. An example specification template is included in Appendix B.

6.1. Your authority

This section introduces bidders to your authority and gives essential background information. If you are a WDA, you should provide summary information here as well as an annex containing the details for each Collection Authority. This enables bidders to get a clear picture of the context of the work, ensures there are no misunderstandings about services and maximises the chance suppliers will bid because they need to spend less time finding things out. It should include:

- **Information about the geographical location**

  You should use this section to explain your geographical location (e.g. north London), your responsibilities (collection, disposal, both), which WDA covers your Borough (if applicable) and the Boroughs or non-London authorities adjacent to you and which, if any, you have working arrangements with (e.g. shared back office functions). This will enable all bidders to compete fairly, even if they have no knowledge of your authority's area.

- **Your properties, household numbers and types**

  This section should cover the important demographics of your authority including the total number of dwellings, the number which receive a kerbside collection and the number which receive a communal collection.

- **Your LOAC characteristics**

  This section should provide information about the LOAC characteristics of the area and the numbers of properties in each category, shown as a table.

- **Your waste and recycling services**

  This section should give potential bidders enough information about your waste and recycling services to understand what is likely to be involved in organizing the project. You should refer to your website and cover; method of service delivery (in-house, contracted out), information on the dry recycling, food waste and garden waste streams and the arrangements for residual waste.

6.2. Your project

The second section of the specification should move on to describe what you want and why. It builds strongly on the 4Ws table (see Table I Example of What, Who, Why and When (4Ws) table. It should include:

- **Any useful background information, for example the results of previous waste composition analyses**

  The purpose of this section is to ensure all bidders have any background information they might require as a starting point for the new project. It should include what is already known about the composition of waste, including headline data from any previous analysis and a link to the published report (if the report wasn't published, a copy should be included in the procurement pack). A brief explanation of any service changes since the previous set of data might also be included.

- **Your project aims and objectives (from the 4Ws table), focusing on what you intend to do with the data**

  The purpose of this section is to explain the thinking you put into your 4Ws table. It should set out what you want to know, who needs this information, why and when. It should include the waste streams and services you want to know about and the geographical area you want to include, if not the whole authority area. It is worth including the full 4Ws table as an annex, provided there is no confidential information in it, as this will give bidders the clearest idea of what you need.

6.3. Roles and responsibilities

Section 3 of the specification clarifies respective roles and responsibilities, making it clear what you need from the supplier but also what you are able to bring to the project yourself, including details of a suitable sorting site (if you have managed to identify one) and the information needed for property selection. It should set out how you see the supplier's role and how you see your role. If you know the specific individuals who will make up the project team on your side, you could also introduce them here.

- **Property selection**

  This refers to the process of determining which specific domestic properties, street blocks, blocks of flats or estates waste will be taken from. This process always involves waste authority input because decisions need to take account of operations, such as round configurations, whether or not it is led by the supplier. Here, you should set out whether have you already selected the properties, in which case you should refer to the section of the specification where it is set out, or whether the supplier is expected to do it, the latter being common practice.

- **Collecting the waste**

  This refers to the fieldwork stage where the waste earmarked for sampling is collected and transported to the sort site. The allocation of responsibility may be different for the kerbside service, where it is normal practice for the supplier to take the lead (using a van to collect the waste from selected properties), and the flats

service, where either the waste authority or the supplier can take the lead (using an RCV to collect the waste).

- **Sort site**

  If you have been able to find a suitable sort site (see 4.5), it will be useful for the bidder if the space available is set out, as this will influence the size of the sort team and the number of households they are able to sort each day. Provide photographs of the proposed sort site if you can. If known, the opening times are also useful to state here. If you have been unable to secure one, then outline here that you expect the supplier to do this.

- **Sorting, weighing and recording amounts of waste**

  This will be the supplier's responsibility, and subsequent sections will elaborate on it.

- **Processing and analysing the data**

  This refers to the process of digitising, systematising and analysing the weight data collected in the study. This will normally be the supplier's responsibility.

- **Reporting**

  This refers to the process of writing up the results, providing data and attending a meeting to present and explain them. This will normally be the supplier's responsibility.

6.4. Your requirements

This section moves into the detail of what you expect the supplier to do, and will likely form the basis of any contract. It is your opportunity to clearly state that the approaches set out in this guide are to be adopted for the study. It should make use of a more formal, 'the supplier will' kind of style compared with previous sections. This is to ensure there is no possibility of misunderstanding. It should highlight aspects that are non-negotiable and must be complied with, and aspects where you are looking for bidders to add value by making their own suggestions about how to achieve your objectives.

The section should include:

- Details of the inception meeting
- The requirement for all samples to be selected randomly using a stratified random sampling approach[8]
- The full cycle of waste and recycling to be collected, with residual going first
- A total of at least 250 samples for the kerbside element of the work and a further 250 samples (minimum) for the flats element
- Anything you require the supplier to do in the run up to the fieldwork stage of the work including sort site requirements, informing Elected Members and other council

[8] Further information on sampling techniques is included in Appendix C.

services, informing the police, any health and safety assurances you need, and signing off the final version of the waste category lists to be used at the sort.

- Restate who will be responsible for collecting the waste, and any requirements related to collection.
- The information that you expect to be reported at the end of the project.

The data you require will come out of your 4Ws table, so you should refer back to it when writing this section.

6.5. Deliverables

'Deliverables' refers to the tangible things to be produced as part of the work. It includes tools (e.g. category lists) as well as reports and databases. Where possible, deadlines should be attached to each deliverable, and whether it will be made public or not.

6.6. Quality assurance and risks

In this section, you should be clear about the quality standards you expect, and the things that you expect the supplier to have in place. You should also ask about risk mitigation and management. You will have a key role to play here too; aside from the normal risks associated with delivering projects, the main risks that the supplier can influence are (see 7.1):

- The risk that waste for sampling is collected by the normal collection crew
- Concern from members of the public at the time of sample collection
- Complaints and requests for waste to be returned after waste has been collected from selected households
- Lack of access on the day of sampling to bin stores (in purpose built flats).
-

6.7. Timeline and budget

In this section you should set out a clear timeline for the work and, if your procurement process allows, a maximum budget. Providing an idea of the budget can be very helpful if you are unable to precisely specify your requirements, because it allows bidders to devise feasible approaches and realistic sample sizes.

6.8. Appendices

You should append any useful information to the specification, including:

- Results of previous waste composition analyses
- Your completed 4Ws table
- Your completed LWCL for each service

- Details of the sort site, if you have been able to find one, including dimensions, photographs and a floor plan if possible
- Your list of purpose built flats, with other details completed as much as you can

7. Supporting the fieldwork

The Waste Authority's responsibility for a project does not end when the purchase order is issued. You transition from being a buyer to being a quality assurer, a role which continues right up until the final report is signed off. This responsibility is often overlooked, but it is critical for ensuring you get the high quality information you need. This chapter summarises those responsibilities and sets out the kinds of activities you must be prepared to do.

7.1. Risk management and mitigation

Suppliers are well aware of the risks of running a WCA. They will have outlined their risk mitigation and management plans in their tender, some of which they will address themselves, and some of which they will expect you to work with them on. The most important ones are summarised below.

7.1.1. The regular crew collects the waste

Ensure you and the supplier:

- Involve the crew manager in the project from the start
- Brief the relevant crews on at least two occasions
- Remind the crew on the morning of the scheduled collection
- Have contact details for the crew
- Have checked that In-cab routing systems can cope with missing properties for the duration of the study weeks

If, despite all these safeguards, the supplier discovers that the crew has picked up the waste, you may need to be on hand to find alternative sample areas or rework project schedules. The Supplier may also wish to include a surplus of street blocks in the sampling so waste can be collected from alternative streets at short notice if required.

7.1.2. General concern for members of the public

Members of the public can become concerned about identity theft if they see a different vehicle or crew collecting waste in a different way to normal. Providing a clear briefing for the contact centre, including the social media team, should help them reassure residents that the project is official, that it will help improve services, and that no individual household's waste will be identifiable. Councillors will have a role to play here too in local social media groups by providing a quick response to any concerns. Provide the Supplier with a Letter of Authority on Council letterhead confirming that they are acting on behalf of the authority. The letter should

include a council officer as a contact point should residents have any concerns. The vehicles used by the Supplier to collect waste should have appropriate branding (this can be easily achieved through the use of magnetic signs). You will need to agree with the Supplier a protocol for what happens if a resident says they do not want to be involved in the study (typically, once the waste has been loaded into the back of the collection vehicle, it can be difficult to isolate and retrieve it.)

7.1.3. A complaint from a member of the public

Complaints associated with WCA will either be about the way the waste collection was carried out (perceived trespass or alleged damage to property) or invasion of privacy. Your supplier will have processes for dealing with both and swift implementation of them will normally resolve the matter. Any complaints should be dealt with by the Waste Authority's project manager promptly and professionally, including making themselves available at the scheduled time of sample collection.

7.1.4. Negative attention from the media

Adverse media attention can gain traction if councillors are unaware of the study when a journalist contacts them. Briefing councillors to ensure they understand the benefits of the project and the mechanisms in place to assure confidentiality will allow the Waste Authority to send consistent messages. Early discussions with communications colleagues will enable rapid response to both positive and negative interest. They will also be able to advise on ways to secure positive coverage, before, during and after the fieldwork phase.

7.1.5. The supplier has difficulty accessing the waste

Suppliers may have difficulty accessing waste stored in locked areas at purpose built flats. You should prepare as thoroughly as possible by consulting the normal crew about access and arranging for the supplier to be issued with keys and door codes. You should also be available on collection days to deal with issues as they arise, which may mean early starts.

7.2. Assure the quality of the fieldwork

It is your role to work alongside your supplier to satisfy yourself they are doing what they said they would and double-checking results and reports.

Suppliers are used to having visitors on site, and many encourage it so their clients can see for themselves the kinds of items being found in the waste. Checking for yourself that the waste is being collected from a truly random set of properties, that waste is being sorted in the way the supplier proposed, that the items are being weighed accurately, and that weights are being diligently recorded and double checked will help give you confidence in the reliability of the results. You could check that:

I. Properties are being randomly selected during the collection process; deliberately selecting or excluding specific properties contravenes the principle of random selection, which can compromise generalisability

2. All the waste from each sampled waste container is collected and taken for analysis; if some is left behind it can bias the sample and therefore the results.
3. All the waste that has been collected and taken to the sorting site is sorted and weighed; all the work done to ensure a robust sample can be undone if some of the waste isn't included.

You should not be worried about asking questions if you are unsure about something you see. If you see something of concern, you should raise it straight away with the most senior member of the supplier's on-site staff and subsequently with the supplier's project manager.

8. Quality assuring the results

As the buyer, it is your role to review the deliverables and confirm they meet your standards set out in your specification. This section explains what you should be looking for.

8.1. Check for completeness and coverage

The first and most obvious thing to check is whether the supplier has provided every deliverable you have asked for – data, report, photos etc. If you have required a report, it is a good idea to ask for an outline of the proposed contents as part of the commissioning process as this avoids receiving something that doesn't meet your needs.

For many Waste Authorities, the most valuable deliverable is the data file. You should check whether this includes every 'cut' of the data you have asked for, e.g. by LOAC category, by block of flats. You should also check that you understand what each tab, each column and each row contain and ask for it to be labelled if not.

8.2. Check for usefulness

There may be some things that make a report more or less useful to you. For example, you might want to check you have full digital access to any graphics used so you can amend them for different purposes, and that there is no proprietary data that you will not be allowed to publish without consent. Reconfirm your needs when discussing what is required in the report with the supplier.

8.3. Check for quality

When you first receive the report, you will naturally be most interested in the results. Before signing off the report, you should use your professional experience and common sense to check the results. You might, for example, check that data in tables adds up, that all categories are included, and that numbers reported in text are the same as those shown in tables and graphs. The method used for WCA does not allow for a quantified, statistical measure of error, but you can ask suppliers for their subjective assessment, expressed, for example, as a RAG (red/amber/green) rating. Suppliers will know whether they have encountered something unusual during the analysis e.g. a garden waste bin full of windfall apples, and whether that makes the results less reliable.

Appendices

Appendix A - Property selection processes

The following sections outline the process for the buyer to follow if they decide to complete the property selection process themselves (although it is recommended that this task is carried out by the Supplier, for the reasons stated in 4.7.2). Different approaches for selecting kerbside properties and purpose built flats have been outlined.

If you have outsourced your waste collections service to an external provider, you may need to work with your contractor to obtain the required property and round information - a data cleanse exercise may be required in this instance.

You will also need to have (or know someone who has) advanced spreadsheet software skills (e.g. MS Excel for example) as you will need to be able to create 'V look-up' and 'Count if' formulas as part of the process.

9.1. Kerbside property selection

9.1.1. Allocating LOAC

Step 1 – Remove all commercial properties and purpose built flats from your rounds lists, in order to prepare your full list of kerbside properties, including individual postcodes.

Step 2 – Link each property to a LOAC group via their individual postcode.[9]

Step 3 - Determine the proportion of properties on your list that fall into each LOAC Super Group and LOAC Group. Table 5 Example shows an example for Step 3.

Table 5 Example for Step 3

LOAC Super Group			LOAC Group			
Name	No. of Properties	%	Name	No. of Properties	% of Super Group	% of Properties
A: Intermediate Lifestyles	42,250	55%	A1: Struggling suburbs A2: Suburban localities	36,758 5,492	87% 13%	48% 7%
B: High Density and High Rise Flats	7,500	10%	B1: Disadvantaged diaspora B2: Bangladeshi enclaves B3: Students and minority mix	6,525 300 675	87% 4% 9%	8% <1% 1%
C: Settled Asians	9,375	12%	C1: Asian owner occupiers C2: Transport service workers C3: East End Asians C4: Elderly Asians	5,906 3,469 0 0	63% 37% 0% 0%	8% 4% 0% 0%

[9] Lists of London postcodes and their associated LOAC can be found here: https://data.london.gov.uk/dataset/loac-at-postcode

D: Urban Elites	625	1%	D1: Educational advantage D2: City central	n/a	n/a	n/a
E: City Vibe	0	0%	E1: City and student fringe E2: Graduation occupation	n/a	n/a	n/a
F: London Life-Cycle	0	0%	F1: City enclaves F2: Affluent suburbs	n/a	n/a	n/a
G: Multi-Ethnic Suburbs	16,500	21%	G1: Affordable transitions G2: Public sector and service employees	8,254 8,246	50% 50%	11% 11%
H: Ageing City Fringe	875	1%	H1: Detached retirement H2: Not quite Home Counties	n/a	n/a	n/a

Step 4 – Include any super group which contains more than 20% of your properties. In the example above, this would mean including Super Groups A & G , indicated in blue.

Step 5 – If after following step 5, less than 80% of your properties are included, return to the table and include those super groups that contain less than 20% of your properties (but not less than 5%). In the example above, these are indicated in orange.

Step 6 – Create a table of the numbers of properties within your selected LOAC Super Groups and their associated LOAC groups, and their overall percentage in relation to the borough wide numbers. Table 6 shows an example for Step 6.

Table 6 Example for Step 6.

LOAC Super Group	Number of properties (from previous table)	% of all properties (from previous table)	% of properties in selected LOAC Groups
A: Intermediate Lifestyles	42,250	55%	56%
B: High Density and High Rise Flats	7,500	10%	10%
C: Settled Asians	9,375	12%	12%
G: Multi-Ethnic Suburbs	16,500	21%	22%
Total	**75,625**	**98%**	**100%**

Step 8 – Determine which allocation method you want to use; either

1) In proportion proportionally allocate these relative to the proportion of properties within each super group (up to 250 properties). This method allows you to gain an accurate reflection of the borough as a whole.

2) Equal (250/4) split the properties equally between each of the groups. This method allows you to gain maximum data from each LOAC type to increase the understanding of any differences.

3) In proportion but boosted proportion the properties, but boost those groups that contain less than 50 up to 50. This method allows you to gain an accurate reflection of the borough as a whole, ensuring a minimum sample for statistical purposes.

Table 7 shows an example for Step 7.

Table 7 Example for Step 7

LOAC Super Group	Number of properties (from previous table)	% of all properties (from previous table)	% of properties in selected LOAC Groups	Allocation method		
				In proportion	Equal (250/4)	In proportion but boosting to 50 where needed
A: Intermediate Lifestyles	42,250	55%	56%	140	63	140
B: High Density and High Rise Flats	7,500	10%	10%	25	63	50
C: Settled Asians	9,375	12%	12%	30	63	50
G: Multi-Ethnic Suburbs	16,500	21%	22%	55	63	55
Total	**75,625**	**98%**	**100%**	**250**	**252**	**295**

Once these steps have been followed, you can now start to select your individual addresses.

9.1.2. Selecting street blocks

A 'street block' is the small geographical area from which the sample of waste will be sourced. It will contain more than the required number of properties to allow for households that do not set out waste or withhold their waste. The properties will all come from the same LOAC category and will be physically adjacent to one another.

The size of any one street block will be determined by the number of samples that can be legally carried on the supplier's vehicle, which will depend on how much waste the selected households produce. For the purposes of the example, we are assuming a maximum of 50.

Step 1 - Select the rounds containing the highest number of properties in each of the selected LOAC Super Groups. Table 8 shows an example for Step 1. Selected rounds are indicated in red.

Step 2 – Select consecutive round days, where possible choosing the round with the most properties for each Super LOAC. Make adjustments where necessary. These are indicated in green.

Table 8 Example for Step 1

Round	A1: Struggling suburbs	A2: Suburban localities	A1 & A2 Total	B1: Disadvantaged diaspora	C1: Asian owner occupiers	C2: Transport service workers	C1 & C2 Total	G1: Affordable transitions	G2: Public sector and service employees	G1 & G2 Total	Round total
Monday 1	965	64	1,029	13	59	56	115	110	187	297	1,454
Monday 2	638	24	662	131	213	416	629	61	104	165	1,587
Tuesday 1	934	22	956	339	118	90	208	49	21	70	1,573
Tuesday 2	509	6	515	104	260	35	295	49	707	756	1,670
Weds 1	872	157	1,029	65	106	35	141	122	187	309	1,544
Weds 2	494	94	588	65	177	28	205	464	229	693	1,551
Thurs 1	785	24	809	13	59	21	80	110	312	422	1,324
Thurs 2	1,051	125	1,176	26	83	7	90	134	249	383	1,675
Friday 1	562	26	588	548	106	7	113	122	83	205	1,454
Total	**6,810**	**542**	**7,352**	**1,305**	**1,181**	**695**	**1,876**	**1,221**	**2,079**	**3,300**	**13,833**

Having selected the rounds, on review it is apparent that there needs to be an adjustment because there are no collections on Tuesday. This gap in the schedule will add cost to the project. Although Tuesday round 1 has a higher number of properties, Tuesday round 2 will need to be selected in order to maintain all of the collections within week 2. This will free up Friday, which will not add cost to the project.

The selected rounds will therefore be:

- Super Group A Thursday 2 (1,176 properties to choose from)
- Super Group B Tuesday 2 (104 properties to choose from)
- Super Group C Monday 2 (629 properties to choose from)
- Super Group G Wednesday 2 (693 properties to choose from)

Step 3 - From the complete list of 13,833 properties, select only the Monday Round 2, and choose a random number.

Step 4 - Look up the selected row in the list (or the closest visible row number to the randomly selected number).

Step 5 – Select the number of properties required (as determined by step 8 in the previous section) by highlighting those properties that are adjacent to your randomly selected property and within the same LOAC Super Group.

It is recommended that you select 100% more properties than the number you identified, to allow for those households that don't present their waste.

For some LOAC Super groups, you may need to develop a list of more than one street block, as only 50 properties worth of waste can be carried on a vehicle at one time.

Step 6 – repeat steps 3-5 for the other rounds

In order to produce a selection of flats for sampling, the process is more complex, and is outlined below.

9.2. Flats property selection

9.2.1. Property portfolio information

The collection and maintenance of good robust information about your communal property portfolio, is essential, not only for this exercise, but as standard best practice to allow a good understanding of the changes and issues within different blocks of flats and estates.

In order to develop a property sample for use within a borough wide waste composition analysis, all of the information available to you from within the Council, (potentially from a number of different departments), on the details of the flats within your Borough needs to be used. This includes both quantitative information (such as number, type and location of bins) and qualitative information (such as anecdotal information from the crews about side waste, and frequency of overfull bins for example). This will allow you to most accurately reflect the character of the flats within the borough and ensure your sample is as representative as possible.

The process for selecting the communal properties to be sampled requires a different approach to that of the kerbside property selection, as flats differ much more in characteristics and therefore there are a number of variables which need careful consideration when selecting the sample. These variables include:

- **Types of flats**

  The flats sample should reflect the types of flats found within the Borough. For example, if the Borough mainly has low-rise small blocks, or large high-rise flats, these should form the majority of the flats sample. Where possible, several blocks should be included within the flats sample to encourage the inclusion of a variety of waste behaviours and performances. For example, it is preferable to include one block of 20 households, one block of 50 households and 5 blocks of 6 households, instead of a single block of 100 households, as long as this reflects the population.

- **Boundaries**

  Care should be taken to identify properties where waste can be clearly attributed to a number of households to enable accurate waste arising calculations (kg per household per week). If there are multiple bin stores within an estate, knowledge of which residents use which bin store is not essential, as long as all bin stores in the estate are included when collecting the waste for sampling. For example, if an estate has 4 bin areas for 5 blocks of 6 flats, all 4 bin areas should be included and assumed to serve all 30 households. All bins for the desired waste stream within each bin area must be included, as collecting just a sub-sample is not a robust enough approach.

- **Avoiding outside influences**

  Whether the waste contained within the bin stores/areas can all be attributed to the residents, or whether easy access could allow trade waste or fly-tipping to be deposited. Residential flats sharing waste areas with commercial properties, or blocks of flats containing businesses, should be avoided.

- **Frequency of collection**

  Collection days and frequency are a consideration when selecting which flats to sample. Ideally the waste from a full collection cycle should be included for each waste stream. As waste composition differs across the week, sampling waste for less than a week should be avoided. For example, if a block receives residual waste collections three times a week (Monday, Wednesday and Friday) and dry recycling collections on Thursdays only, four visits will be required to collect a week's worth of residual waste and dry recycling from this block. The higher the number of visits, the higher the costs. Flats which receive a lower number of collections are less operationally complex, and costs are reduced. Flats which receive weekly collections for the waste streams included in the analysis on the same day of the week are optimum, as long as this reflects normal practice within the Borough.

  If ongoing issues are experienced regarding the material being collected by the crews prior to the supplier arriving at the site, then consider asking the supplier to collect the material on the afternoon prior to the normal collection day.

- **Recycling performance**

  If possible, blocks which are known to have exceptionally good or bad performance should be avoided. The aim of the sampling is to select flats which are representative of

the wider population and selecting an overly well or poor performing area would skew this.

As with the kerbside property selection, it is recommended that a minimum of 250 households' worth of waste from flats is collected for a Borough-wide waste analysis. While larger sample sizes lead to higher confidence levels, the relationship is not linear and needs to be balanced with operational and financial feasibility.

If budgetary constraints do not allow for the analysis of waste from a total of 500 households (250 kerbside and 250 flats), a single 250 household analysis including both kerbside properties and flats could be considered. The flats sample size should reflect the proportion of flats within the Borough. Boroughs with more flats are recommended to take a more robust approach compared with those Boroughs with fewer flats.

For example, if the data shows that flats account for 40% of the Borough's population, the sample could include 100 flats and 150 kerbside properties. If flats account for 95% of the Borough's housing, the sample could include flats exclusively, while if they account for only 10% of the Borough's housing the case could be made to exclude them from the sample entirely.

9.2.2. Operational considerations

Once you are satisfied that you have gathered a sample of 250 flats households (or whichever number you select depending on your budgetary constraints), it is important to ensure that the following operational considerations are clarified prior to the deployment of a suppliers fieldwork team:

- **Location of waste**

  The number of waste storage areas and their location must be known, to inform the sampling team and ensure all waste is collected. The number of bins in each area is useful additional information, but not essential. Site maps, where available, are the best way to provide this information. If formal site maps are unavailable, annotated satellite view screenshots or sketches can be used to provide this information informally. You may want to ask your Supplier to conduct a 'recce' of the blocks included in the sample the day before to ensure any potential issues are identified.

- **Access requirements**

  Access requirements must be considered when sampling flats. Areas with restricted access have the advantage of being less likely to contain outside waste such as trade waste, but if the sampling team is not able to gain access to the bins to collect the waste, there will be no material to analyse. Details of any access codes or keys are essential.

- **Informing the regular crew**

  Care should be taken to ensure the regular crew collect all waste from all bins in the collection preceding the waste composition analysis, as missed collections or partially collected bins would affect the results. In addition, crews need to ensure that they don't collect any waste during the allocated sampling period, as this needs to be collected by the suppliers fieldwork team only.

  If ongoing issues are experienced regarding the material being collected by the crews prior to the supplier arriving at the site, then consider asking the supplier to collect the material on the afternoon prior to the normal collection day.

- **Collection location and approximate time**

  Details of whether the bins are moved to a different location for collection, and if so by who and when are also key. For example, if the bins are moved by the caretaker on collection day out of the chute rooms to the kerbside at 10am for an 11am collection, they will not be available for collection from the kerbside at 7am.

Appendix B – Example template specification

The below is example text, intended to show indicative content and level of detail. This should be carefully amended in order to reflect the specifics of your local authority. See section 6 for guidance.

1. Your authority

1.1. The Authority

The London Borough of X is located to the east of the City of London. The Borough is the Waste Collection Authority and West London WDA is the waste disposal authority. We work closely with XXX Borough, including sharing a transfer station at Longford Lane.

1.2. Households

X Borough has 95,000 households, of which 45,000 live in purpose built flats provided with a communal service and a further 5,000 live in flats in property conversions or above commercial premises and are mainly served by a kerbside service.

We have 60 blocks of purpose built flats and 10 estates. They are a mix of private and housing association run. A full list of our purpose built flats is included in an annex. Flats managing agents have been informed about the study.

45,000 properties are ground level and provided with a kerbside service.

1.3. LOAC characteristics

Table X below shows the number of properties within each LOAC category. This shows that three Super Groups dominate – A, C and H.

[Insert table]

1.4. Waste and recycling services

Waste collection is an in-house/contracted out (delete where appropriate) service. We operate an alternate weekly collection of residual waste and dry mixed recycling, with a weekly collection of separate food waste. The service targets paper, card, plastic bottles and pots tubs and trays, tins and cans and foil. We do not accept glass in our mixed dry recycling but instead provide a network of bring banks. We offer a charged garden waste collection, which 15% of

properties are signed up to. We estimate that around half of the remaining properties do not have gardens.

Residual waste is contained in 240 litre grey wheeled bins, except for c.400 properties which are provided with 140 litre bins and c.550 properties which are provided with 360 litre bins. Recycling is contained in 240 litre blue-lidded wheeled bins and food in a 23 litre kerbside caddy.

Food waste is collected in a food waste vehicle at a different time of the day to residual waste and mixed dry recycling, which are collected in RCVs. Garden waste is collected in pre-paid sacks and collected fortnightly on the recycling week, but for most areas, on a different day.

Purpose built flats and some property conversions are provided with 1100 litre containers for residual waste and dry mixed recycling. They are not currently provided with a food waste recycling service.

For further information on our waste and recycling services please refer to the following web page (insert link)

2. Your project

2.1. Background information

A waste composition analysis was carried out in 2016 covering all the Borough's waste and recycling services as part of a WDA-wide study. It was carried out by xxx and is available at (insert ink). It showed that there was a large amount of food waste in our residual waste, which prompted the introduction of a food waste service for kerbside properties in April 2019. Since 2016 we have also moved to a chargeable garden waste service which reduced the tonnage of garden waste collected by about 50%, although the WDA has seen an increase in garden waste brought to HWRCs as a consequence.

Flats were not covered by the 2016 study. Dry mixed recycling coverage has significantly expanded, and now all flats in the Borough have a service. We have also undertaken a programme of bin store improvements, including improved signage, which is currently about halfway through the Borough's purpose built flats and estates.

2.2. Aims and objectives

The aim of the project is to update our estimates of waste composition which are now 7 years old.

Waste composition data is needed by:

- the WDA, to feed into modelling work which will generate estimates of future waste arisings for a new waste strategy
- the Borough's Climate Emergency team, which needs estimates of waste composition to model the contribution waste prevention, reuse and recycling might make to achieving net zero

- the Borough's communications team, who want to run a food waste prevention campaign next year
- the Borough's waste manager, to inform our roll out of the food waste recycling service to purpose built flats

- the Borough's strategy manager and the WDA's strategy team, to assess which materials we could target to achieve ambitions of recycling 60% of household waste by 2030

The scope of the project is collected household waste and recycling, including our flats service. HWRC waste, litter, street sweepings and bulky waste are excluded from scope.

Residual waste from ground level properties and from flats will be included. Mixed dry recycling can be excluded as we have sufficient information from our MRF – this information will be supplied to the successful supplier. The separate food waste recycling service should be included because we need to know more about the characteristics of food waste, including the main type of food (meat, fish, vegetables etc.), whether it is avoidable or not, and the main reasons why it is produced, as far as can be discerned from looking at the waste. The garden waste service can be excluded.

The project will cover the whole Borough, although we would like to know in particular about food waste in the residual stream in the Boroughside estate, which is managed by Pride Housing Association, and our two main high rise tower blocks, Tynepenny Tower and Braun Tower, as these are likely to be the focus of phase I of our flats roll out.

3. Roles and responsibilities

3.1. The Authority's role

3.1.1. Sort site

[If you don't have access to a sort site, include the sourcing of this under section 3.2 'The suppliers role'.]

The Borough has secured the use of SUPPLIER NAME waste transfer station and MRF at ADDRESS for the duration of the project. It has two large tipping halls, one of which is currently used for bulking mixed dry recycling. An area approximately 15 m x 15 m of this hall will be cordoned off for the duration of the work. The site has plenty of space for parking trucks. The area has an electricity supply but no artificial lighting, so portable lighting will need to be organised by the successful supplier. This should be costed into your bid.

The supplier's staff will be able to use site facilities including toilets and staff rest area. All staff will be required to attend a short on-site health and safety induction. A site-specific risk assessment and safe systems of work will need to be provided by the supplier to WTS/MRF SUPPLIERS NAME at least a week in advance of the work starting. The supplier will be expected to supply all required PPE.

WTS/MRF SUPPLIERS NAME will arrange for the sorted waste to be recycled or disposed, and will provide a front end loader and driver to do so, at no charge to the supplier.

3.1.2. Vehicles and drivers

It is expected that the supplier will organise and manage the collection of waste and recycling from kerbside (ground level) properties as the vast majority of containers are 360 litres or less. Should a property with a larger container be randomly selected, the supplier will need to make arrangements for it to be lifted as we are unable to guarantee that a vehicle and crew can be made available. This will also apply to the flats waste element of the project. The supplier will therefore need to make arrangements for collecting and transporting waste and recycling from containers over 360 litres.

OR

It is expected that the supplier will organise and manage the collection of waste and recycling from kerbside (ground level) properties as the vast majority of containers are 360 litres or less. Should a property with a larger container be randomly selected, we are able to supply a vehicle for this purpose, and for the flats waste element of the project.

3.2. The supplier's role

The supplier will be responsible for:

1. Selecting the properties from which waste will be taken. The Borough's operations manager will work closely with the supplier to ensure that decisions are operationally feasible.
2. All practical elements of the work, including collecting, transporting, sorting and weighing the waste (the fieldwork). The supplier will provide the staff, vehicles and equipment required to complete this work successfully and to high standards of health, safety and environmental protection. The supplier will ensure that all required permits and licences are in place, including a waste carrier's licence, and that there are suitable levels of public and employers liability insurance. The supplier will comply with all requirements of SUPPLIERS NAME in relation to using the sort site. The Borough's project manager may audit the supplier's operations to assure the quality of the process.
3. Processing the data, including quality control of data inputs and the analytical process. A clean and fully labelled data file will be provided to the Borough's project manager for sign off.
4. Providing a report and presentation of the results.

4. Requirements

4.1. Inception

The supplier will be expected to attend an inception meeting on DATE & TIME at LOCATION.

The meeting will be attended by NAMES AND JOB TITLES OF AUTHORITY OFFICERS, and will be used to provide an opportunity to ask questions, clarify proposals and work through

potential issues. The meeting will also be used to put a mechanism in place for regular updates throughout the project.

4.2. Designing the property selection

Kerbside service

The supplier will design a sampling framework, based on the London Output Area Classification (LOAC). The sampling framework will enable a representative sample of residual waste and food waste to be taken so that an estimate of the composition of typical residual and food waste can be derived. Bidders should set out their proposals for doing so in their bids.

Flats service

The supplier will design a sampling framework, based on the Councils knowledge of flats within the borough.

The Borough has, as part of its flats recycling improvement programme, audited around half the bin stores, and the sample will be taken from those that have been audited, which are listed in Appendix X. We have carefully considered whether this is likely to introduce bias into the results and believe that the flats for which bin store audits have been done are socio-demographically reflective of the Borough's population of flats. Additionally, we believe it will be important to capture compositional data based on the improved bins stores as we expect to have completed the improvement programme by the end of this financial year. Bidders should set out their proposed approach for doing this in their bids.

4.3. Selecting the properties

Kerbside service

The supplier will work with the Borough's waste operations manager to randomly select properties to be included. A total of 250 properties should be collected, however, the selection should include more than the required number of samples, to allow for households that do not set out, that withhold their waste or for which health and safety concerns on the day of collection prevent the waste being sampled.

The Borough's waste manager will inform the supplier if any of the properties within the selected street block have assisted collections, and whether any of the properties have containers >360 litres. Such properties are to be included, and the supplier is expected to make arrangements for doing so. The operations manager will inform the affected crews that they should not collect waste in that area until advised by the supplier, but the supplier is expected to liaise closely with the driver to ensure everything goes smoothly on the day.

Flats service

The supplier will work with the Borough's waste operations manager to randomly select the purpose built flats to be included. The operations manager will inform the supplier of access arrangements and will facilitate access on the day of collection. The operations manager will also inform the regular crew to ensure they do not collect waste from the selected properties.

Samples should be collected from a minimum of 10 blocks.

4.4. Making arrangements for field work

The supplier will liaise with SUPPLIERS NAME to make arrangements for accessing the sort site and ensure SUPPLIERS NAME health and safety requirements are met. The supplier should ensure that SUPPLIERS NAME is made aware of the details of the work programme and that suitable arrangements are in place for removal of the sorted waste.

The supplier will work with the Borough's project manager to ensure anyone who needs to be informed about the work has been informed. The Borough will take the lead in informing the call centre and elected members. The supplier will inform the police. The supplier will create a form of words that can be used to inform interested parties about the work and provide a point of contact and provide the Borough with their conflict resolution process. The Borough will provide a letter of authority and contact point for concerned members of the public.

The supplier will prepare a site-specific risk assessment and a document setting out safe systems of work to share with SUPPLIERS NAME and the Borough's project manager.

The Borough has prepared a list of waste categories for residual waste and for food waste. This will be used for reporting and therefore will also be the basis of sorting. The supplier will review the proposed list and propose any changes that would add value or that are required from an operational perspective. The Borough will have final sign off of both lists. The London Waste Category List (included in Appendix X) must be used as the basis of categorisation, with any additions added as level 4.

4.5. Collecting waste

Kerbside element

The supplier will collect waste from the selected properties. Residual waste and food waste across the whole two week collection cycle will be collected and analysed (with the residual waste to be collected first). Bidders should explain how they will obtain sufficient quantities of food waste, given that participation rates are approximately 15% across the Borough as a whole, and significantly less in some areas of the Borough. All waste of the targeted waste stream will be collected from the selected properties, except where waste is withheld by the householder, or where health and safety concerns preclude it.

Flats element

The supplier will collect waste from the selected properties. In principle, a week's worth of waste should be collected, but in practice this will depend on the amounts arising. Bidders should set out, in their proposal, how they intend to ensure sufficient quantities of waste are collected and sorted so as to achieve a representative sample of each flat's waste

For both kerbside and flats, the supplier will liaise with the regular crew to ensure they know to leave the sampled households/flats, and for the kerbside element, to ensure that any withheld waste is collected. Streets and bin stores must be left in a tidy condition following the collection, and bins returned to the place where they were found.

4.6. 4.6. Sorting and weighing the waste

The supplier will ensure that the staff carrying out the sorting are fully trained, both in identifying the waste categories to be separated and in the health and safety requirements associated with manually handling waste.

The Borough's project manager will visit the sorting site unannounced from time to time to assure the Borough that quality standards are being complied with.

4.7. Data analysis and reporting

The supplier will process, quality assure and analyse the data produced from the fieldwork. Bidders should set out their approach to data analysis, and in particular how they intend to scale up to the whole of the Borough from the sample, and how they will combine data from the two seasonal samples to generate an annual average.

The data should be provided in spreadsheet format, fully labelled so as to be comprehensible to officers.

A written report will also be required. This will describe the methods used and provide tables and graphs, as the supplier feels most relevant, to display the results. As a minimum they will include:

- % composition of residual waste, for the Borough as a whole, for kerbside properties, for flats, and by LOAC super group
- % composition of food waste, for the Borough as a whole and by LOAC super group
- kg per household per week for the components of residual waste and food waste, for kerbside properties

Suppliers should comment on the potential for recycling of the residual waste, and potential for prevention for food waste. Seasonal differences should also be commented upon.

The supplier will attend a meeting to present and discuss the results with officers of the Borough and the WDA.

5. Deliverables

The supplier will provide the following deliverables:

1. A presentation of their proposed approach as part of an inception meeting
2. A proposed sampling framework for kerbside properties, for sign off by the Borough
3. A proposed sampling framework for flats, for sign off by the Borough
4. A 'form of words' for use by the call centre and others to explain the study to members of the public and other stakeholders
5. A category list for the residual waste sort, for sign off by the Borough and WDA

6. A category list for the food waste sort, for sign of by the Borough
7. A site specific risk assessment and safe systems of work for WASTE SUPPLIERS NAME and the Borough
8. A spreadsheet containing the data, full labelled so as to be comprehensible to Borough and WDA officers
9. A report, containing a background and introduction to the work, a summary of the method used and the results in tabular and graphical form

The final report will be published by the Borough and the data will be made available to the WDA, the GLA and other stakeholders.

6. Quality Assurance

It is essential that high quality data, comparable with other Borough analyses, is produced by this work as important strategic decisions are going to be based upon it. Suppliers should ensure they:

1. Use LOAC and the London Waste Category List to ensure data can be easily compared and aggregated
2. Diligently apply the principle of random selection of samples to ensure data can be reliably generalised
3. Sample a minimum of 250 households' waste for the kerbside element as a minimum, and 10 blocks for the flats element
4. Sample a full collection cycle of waste for the kerbside element, and as much waste as possible with operational and budgetary constraints for the flats element
5. Assure high quality operations throughout the process

Bidders should explain how they intend to assure quality throughout the process in their proposals. The bidder should also include how they will address the following risks:

- the risk that waste for sampling is collected by the normal collection crew
- concern from members of the public at the time of sample collection
- complaints and requests for waste to be returned after waste has been collected from selected households
- lack of access on the day of sampling to bin stores (in purpose built flats).

7. Timeline and budget

The timescale for the WCA is driven by the waste strategy work, for which composition data is required by, which is DATE. The available budget for this work is £XXX

8. Appendices

[Insert any appendices.]

Appendix C – Sampling

Sampling

Sampling in the context of WCA means collecting, sorting and weighing a *small amount of waste* that we have reason to believe will be similar in composition to the total waste, which would be too expensive and time-consuming to sort and weigh. Once we know the composition of the small amount of waste (the sample), we can apply those percentages to the total amount of waste to work out how much of each material there is, provided there is good reason to believe the sample is *representative* of all the waste.

Measure of viability

When you take a sample, you can never be completely certain that the results are what you would have found had you been able to collect, sort and weigh all the waste, due to the variability of the material.

For this reason, a measure of variability is applied, to quantify the sampling error associated with data. 'Error' used in a statistical sense does not mean a mistake. A statistical estimate of error is a way of presenting the uncertainty associated with data, and is intended to allow the user of the data to make an assessment of the faith they are willing to place in it.

Sampling error is normally expressed as a *confidence interval*, for example 20% plus or minus 3%, which means the true value, had you been able to collect, sort and weigh all the waste, is very likely to be between 17% and 23%. It is normal to quote a level of confidence when using confidence intervals and 95% is the standard level.

Random sampling

An important principle is that samples must be selected at random to have confidence that the small amount of sampled waste is general to all of the waste. This means that every property must stand the same chance of being selected for inclusion. By omitting certain properties, for example because they have access difficulties or because they are in blocks of flats, you bias the results, because the sample is no longer representative of the population.

Stratified random sampling

Because affordability means that only a small amount of waste can be sampled, there is a high likelihood that if properties were purely selected at random, certain types of property may be under or over represented. For this reason, most waste composition studies use a technique called 'stratified random sampling' which targets properties of certain types to ensure they are included and not omitted by chance. Samples should be stratified (sub-divided) according to the characteristics most likely to be driving any differences in waste composition.

Waste composition is very variable from household to household and most of the waste households produce is derived from things householders buy, which in turn is affected by a very wide range of factors. The other main factor affecting waste composition is the waste and recycling services used, how these services operate as well as behavioural choices.

For this reason, it is recommended that the London Output Area Classification (LOAC) is used to stratify the sample (see section 5.1). This will provide information about the composition of

waste for each LOAC Super Group or Group, as well as a scaled up version of the composition of waste for that specific Borough.

Appendix D – Glossary of terms

12.1. Statistical and research terms

Bulk sample	Waste collected for sorting and weighing from lots of different properties all mixed together, e.g. a waste from a normal RCV collection
Demographics	Statistical data relating to the population and particular groups within it, e.g. ethnicity, age and gender.
Fieldwork	The process of collecting, sorting and weighing the waste
Geodemographic	Characteristics of people based on the pooled profile of all people living in a small geographical area
London Output Area Classification (LOAC)	A geodemographic classification system, which groups small areas of London according to their Census characteristics. The LOAC was created by the Greater London Authority[10].
Random selection	An approach to selecting a sample in which each unit in a population has an equal chance of selection
Sampling	The process of selecting a representative set of households or waste for the purpose of determining characteristics of the whole set of households or waste
Stratified random sampling	A method of sampling that involves dividing properties into smaller sub-groups known as strata. In stratified random sampling, the strata are based on shared characteristics, defined using LOAC.

12.2. Waste terms

Block of flats	**A single building containing several dwellings over several storeys**
Business case	A process of gathering information and making the case for doing something differently
Capture rate	The proportion of a particular material captured for recycling, out of all of that material that is waste (residual + recycling)
Collected household waste	Waste that is legally defined as household waste collected at kerbside, flats and HWRCs
Collection cycle	The period over which an individual household receives all its waste services, normally weekly or fortnightly in London
Contamination rate	The proportion of the waste which is not targeted by the recycling service
Dry mixed recycling (DMR)	Comingled materials collected for recycling, excluding food, e.g. paper, card, glass and metals
Dwelling	A place where a person or group of people live with its own unique address and front door
Edible food waste	All food that was intended to be eaten at the time it was produced or sold. It excludes non-edible parts, even if they are integral with the

[10] More information on LOAC is available here: https://data.london.gov.uk/loac/

	item, e.g. a whole avocado is both edible (the flesh) and non-edible (the peel and the stone)
Estate	An area consisting of several blocks of flats, and possible some street level properties
Flat	A dwelling contained within a building with more than one storey and its own front door
Household	Definitions of 'household' are complex. For the purposes of this document, household is synonymous with dwelling.
In-cab system	Software that enables efficient route planning, fuel management and/or recording of waste set-out by individual households or roads
Inedible food waste	The inedible parts of food, e.g. banana peel, avocado stone. Officially 'associated inedible parts' as food is by definition something that is intended to be eaten, so inedible food is not conceptually possible under international definitions.
Kerbside collection	A collection service which picks up waste from the curtilage of each property
Kerbside properties	Properties which have ground level entry and which are provided with the standard waste and recycling service
London Output Area Classification (LOAC)	A geo-demographic classification system, which groups small areas of London according to their Census characteristics
London Waste Category List (LWCL)	The list of wastes devised by ReLondon for use across London
MRF	Materials Recycling Facility – where mixed recyclate is mechanically and manually sorted into categories for sale and disposal
Non-recyclable	Materials that are not targeted by the collection service and for which the MRF cannot find a market and are therefore disposed to landfill or incineration
Plastic film/flexibles	Flexible plastics and other items containing a significant amount of flexible plastics e.g. food pouches
Procurement framework	A list of suppliers who have been through a pre-qualification process to assess competence and financial standing
Purpose built flats	Properties that were built to be blocks of flats, rather than house conversions or flats above shops
Recyclable – non-target	Materials that are not targeted by the collection service, but for which the MRF has an outlet
Recyclable – target	Materials which are recyclable and targeted by the collection service
Residual waste	Waste destined for disposal, normally by incineration or landfill
Round	The area covered by a particular collection vehicle on a particular day
Seasonality	The differences in waste composition that occur due to the differing weather conditions that occur at different times of the year
Sort site	The site where the waste will be sorted and weighed
Specification	The description of the work you require that will form part of the Invitation to Tender
Street block	A number of properties, always more than the minimum required, from which waste will be collected as part of the kerbside element of a waste composition analysis
Supplier	The organisation that will carry out your waste composition analysis
Transfer station	The first place of tipping for waste and recycling, where it is normally bulked up prior to transportation to another site
Waste composition analysis (WCA)	A method of measuring the composition of mixed waste, using sorting and weighing as the principal means of measurement

Appendix E – Acknowledgements

This protocol was prepared by Barbara Leach of Magenta Research & Evaluation under the direction of Gemma Scott and Cathy Cook from ReLondon, and with input from stakeholders and waste composition analysis suppliers. We would particularly like to thank the following stakeholders:

Steering Group

London Borough of Camden

North London Waste Authority (NLWA)London Borough of Newham

London Borough of Bexley

WRAP

East London Waste Authority (ELWA)

Greater London Authority (GLA)

City of London

LARAC

London Borough of Sutton

London Borough of Hackney

Other Stakeholders

Defra

Incpen

M·E·L Waste Insights

RPS

ISL (WI Associates)

West London Waste Authority (WLWA)

WRAP Cymru

Zero Waste Scotland

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ReLondon is the operating name of the London Waste and Recycling Board.