

KERBSIDE COLLECTION OF PLASTIC BOTTLES GUIDE

A guide for local authorities to either roll out a plastic bottles collection at the kerbside, or improve the material quality and capture rates of their current kerbside plastic bottles collection service.

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Contents

Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices
--------------	-------------------------	----------------	----------------	---------------------------	---------------	-----------	---------------------	-------------------------	-------------------------------	----------	------------

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We work with businesses, individuals and communities to help them reap the benefits of reducing waste, developing sustainable products and using resources in an efficient way.

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Front cover photography: Detail of blue and green plastic bottles

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Contents

Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices
---------------------	--------------------------------	-----------------------	-----------------------	----------------------------------	----------------------	------------------	----------------------------	--------------------------------	--------------------------------------	-----------------	-------------------

1.1 Target audience

Local authorities

This guide is aimed specifically at local authorities that:

- Currently have plastic bottle collections in place at the kerbside and are looking for advice on:
 - improving plastic bottle material quality; and/or
 - increasing material quantity.
- Are seeking advice on rolling out a plastic bottle collection service at the kerbside which achieves high plastic bottle capture and quality rates.

Senior officers

This guide is targeted at senior officers within waste teams at local authorities. It aims to communicate the key messages in a digestible and concise format that can be consulted easily during busy schedules.

To ensure ease of access, readability and the broad applicability of the guide, this document does not include detailed technical information on implementing the advice provided. Such detailed information can be obtained from WRAP's [local authority advisory service](#).

1.2 Scope of this guide

As this document is aimed specifically at local authorities, the interventions that are highlighted are focused predominantly on those that can be implemented by local authorities themselves. This document focuses on how local authorities and their contractors can achieve the highest level of quality and quantity from a kerbside plastic bottle collection scheme. To this end, a number of local authorities, material recovery facility (MRF) operators and reprocessors were consulted and their feedback integrated into the guide.

1.3 Definitions

In this guide, quantity and quality are defined as follows:

- **Quantity** – meaning the quantity of plastic bottles captured at the kerbside. Two key measures of this are 'material capture', which is commonly measured in kilograms per household per year, and 'capture rate', which is the percentage of available material successfully captured for recycling by a kerbside collection scheme.
- **Quality** – quality is a subjective term as acceptable levels of impurity vary by reprocessor, and also depend on the equipment and manufacturing processes used, and the markets sold into. Fundamentally, therefore, the definition of quality could be viewed as the supplier's ability to meet the buyer's expectations, as set out in their specification. However, given the need to be specific in the context of the guide, quality is defined by the extent of impurities within the target material stream.

This guide focuses mainly on two grades of plastic: PET and natural HDPE bottle grades. These are both used in the UK for the production of rPET and rHDPE. There are two key stages where the discussion of quality is particularly important:

- firstly, when material is entering the plastic recovery facility (PRF) sorting process; and
- secondly, when material is entering the rPET and rHDPE preparation process.

A local authority's ability to influence quantity is limited to the earlier (collection) stages of the bottle recovery life cycle, including design of the recycling scheme and the degree to which households are encouraged to participate through effective communication programmes. Quality, on the other hand, is something that can be targeted throughout the bottle recovery cycle.

1.4 Our approach

To gather evidence for the development of this guide, several key areas of research were undertaken:

- industry-perspective interviews with plastics reprocessors;
- interviews with MRF operators;
- interviews with local authorities that have demonstrated they are collecting plastic bottles at the kerbside in high quantities and/or of good quality;
- European research; and
- analysis of secondary data.

Summary

This evidence-based guide is relevant to senior officers and other key decision-makers from local authorities that:

- are collecting, or are looking to begin collecting, post-consumer plastic bottles as part of the household kerbside dry recycling collection service;
- are interested in finding out how to improve the plastic bottle quality and/or quantity;
- do not wish to expand the plastic bottle collection to include non-bottle plastic packaging in the short to medium term.

Introduction												Contents
	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices	Guide page 5

2 STRUCTURE OF THIS GUIDE

This guide is organised so that it reflects the life cycle of plastic bottle collection and recycling from a typical local authority's perspective and highlights the key intervention points. This should allow readers to navigate easily to the most applicable sections, regardless of whether or not their authority has a collection regime in place



Contents	Audience	
	Local authority with plastic bottle collection service*	Local authority without plastic bottle collection service
Policy context	This section provides a summary of any relevant policy drivers in the context of plastic bottle collection in Scotland and England.	
Market context	This section provides insights from the sorting and reprocessing industry into the supply of plastic bottles, the types of sorting and reprocessing facilities and processes in the UK, and plastic bottle quality.	
Plastic bottle collection in the UK	This section presents the latest statistics for plastic bottle recycling in the UK.	
Scheme design	For authorities with an established plastic bottle collection in place this section is only going to be relevant if redesign is being considered (e.g. collection contract is coming to an end or service is performing poorly and a service change is being considered).	For authorities without a plastic bottle collection service this is a key section. It is recommended that it is initially skim-read to provide an overview before reading subsequent sections in order to incorporate the actions presented in later chapters in the design of any new service.
Household communications	This section examines 1) communications associated with the roll-out of a new scheme, and 2) ongoing communications. Authorities would be advised to read section 7.3 on improving ongoing communications to households.	This section examines 1) communications associated with the roll-out of a new scheme, and 2) ongoing communications. Both forms of communication are of relevance to authorities wishing to implement a new service.
Point of collection	Authorities with a scheme can use the detail presented here to assist them in maximising the quality of material that is collected.	Authorities without a plastic bottle collection service will benefit from the discussion in this section as it contains a number of implications that should be considered when designing a new scheme.
Post-collection sorting & baling	This section provides guidance on how post-collection sorting and compaction can be used to improve the quality (and therefore value) of plastic bottle collections.	
MRFs	This section examines what measures local authorities can take in coordination with MRFs to ensure that they receive the highest prices for sorted and baled materials. Again, this section is relevant to both types of authorities, either as a source of ideas for implementation within the current scheme or for inclusion within future contracts.	

Figure 1 Document structure

*In 2010/11 90% of local authorities in the UK offered a kerbside service for plastic bottles

Structure of this guide											Contents
Introduction	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices	Guide page 6

Table 1 Biffa's Edmonton MRF – an example of good practice in the design and management of a facility to produce quality PET and HDPE bottle materials

Biffa's Edmonton Material Analysis Facility: A case study	
<p>Background</p> <p>Biffa's MRF at Edmonton, North London, is a large modern MRF. Fully operational since June 2010, the plant was designed for a throughput of 300,000 tonnes per annum and is currently processing 220,000 tonnes per annum with a complement of 250 staff. This scale of operation has made it viable to incorporate a high degree of technology and manual quality control for the accurate sorting of plastics.</p> <p>Processes that lead to quality plastic outputs – an overview</p> <p>The Edmonton MRF separates five key rigid household plastic packaging product lines which include PET suitable for rPET production and natural HDPE that is supplied directly to the Biffa Redcar rHDPE production plant. The process diagram below shows in simplified terms how the plant separates plastic products. The plant actually has two lines for separating co-mingled materials and a separate in-feed line for mixed containers. There are also a few processes not noted in the diagram for simplicity. It is important to note that there is a significant amount of manual removal of plastic films at various stages of the process. The following sections detail the processes that help to maximise PET and HDPE quality. An overview process diagram is shown in Figure 4.</p>	<p>Testing input</p> <p>Biffa recognises that in order to produce quality materials, quality co-mingled input is required. Loads arriving at the plant are regularly sampled (and sorted as a gravimetric assay), and suppliers are given feedback on the quality of the loads. If necessary, loads are rejected.</p>
<p>Removal of other items to leave a container stream</p> <p>The key to successful sorting of the separate plastic bottle streams from a mixed plastic packaging stream is to ensure that as much other material as possible is removed before near-infrared (NIR) separation of the polymer streams. The Edmonton process includes numerous stages of separating other recyclates and contaminants. The significant processes are several stages of separating two-dimensional items (mostly fibres: paper and card) from three-dimensional items (containers: rigid household plastic packaging, glass and cans).</p>	<p>Pre-sort – manual removal of films and large items</p> 
	<p>2D/3D sorting. Papers go up, containers drop through</p> 

Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices	Contents
												Guide page 10

4.2.2 Plastic recovery facilities: front-end of the reprocessing facility

The output from the separate collection or MRF processes may be either:

- baled and sent to a UK reprocessor;
- baled and exported; or
- fed in to a PRF for further sorting.

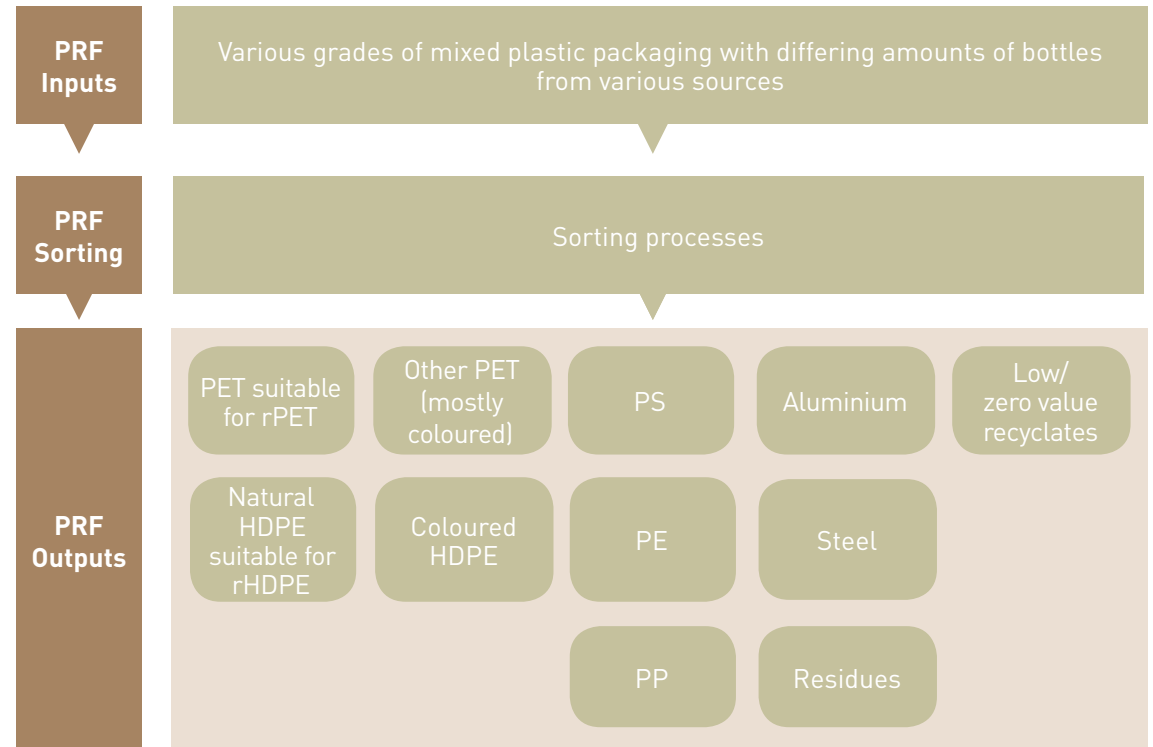
Further sorting in a PRF may be necessary in order to produce the high quality plastic bottle bales required by bottle reprocessors in the UK (a good quality plastic bottle bale is considered to be at the very minimum 85% plastic bottles).

It is important to note that although there are several PRFs in the UK, they are all set up in slightly different ways, and are therefore designed to accept a variety of different input streams. The majority of PRFs are designed to accept a predominantly bottle-rich input material stream, and therefore have limited capacity to handle non-bottle plastics and other contaminants. However, there are a smaller number of facilities which have capacity to handle a wider range of input materials, including mixed plastic packaging and metals.

At present most facilities in the UK have been designed for input material that is close to 40% PET, 40% HDPE and 20% other. The inclusion of non-bottle rigid plastic packaging will therefore substantially alter this mix and could impact on sorting and reprocessing efficiencies.

An example of the typical outputs arising from a PRF is shown in Figure 5 which makes it clear that the plastics are sorted into many more polymer grades than is achievable at typical medium and large-scale MRFs.

Figure 5 Typical outputs from PRFs



Recent rises in capture rates have been associated with expanding kerbside collection services and a decreasing reliance on bring sites. This is illustrated in Figure 7, which shows that between 2009 and 2010 plastic bottle collection increased by 18,051 tonnes; this rise was due to an increasing reliance upon kerbside collections, with a slight fall in tonnage collected via bring sites.

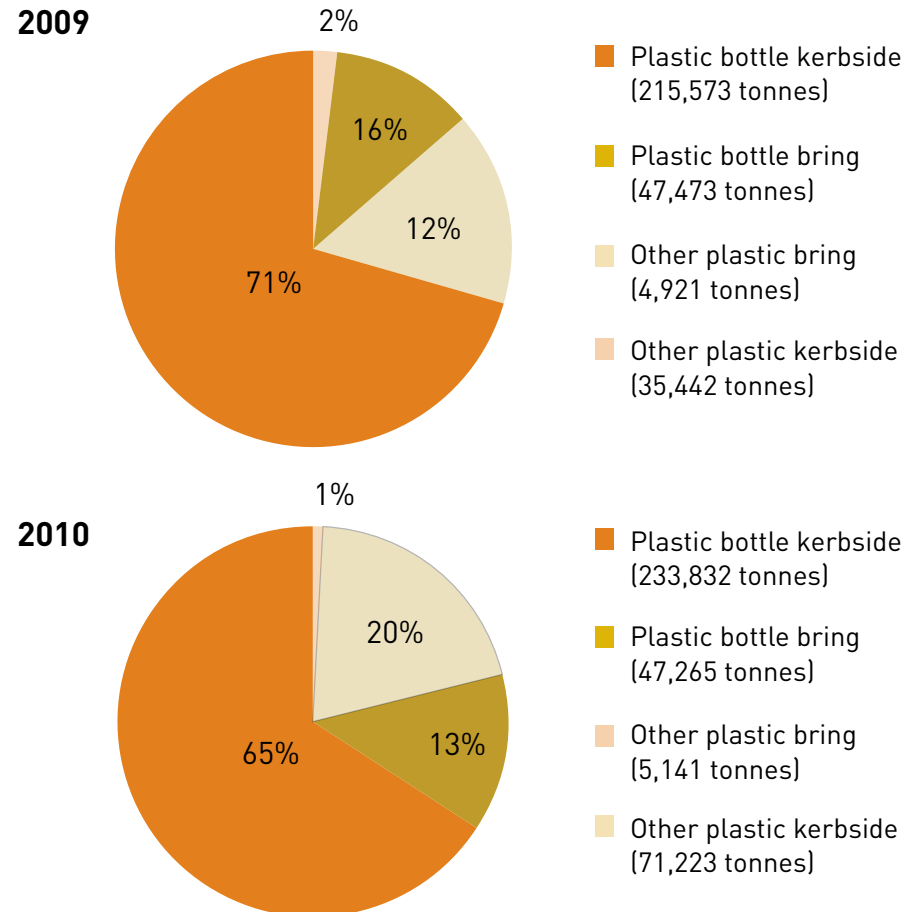
Although the capture rate for plastic bottles has increased markedly in recent years it is still relatively low at 48.5%, especially considering that in 2009/10 87% of UK households had access to a kerbside collection service which collected plastic bottles. According to Recoup’s 2010 survey 74% of authorities collecting plastic bottles at the kerbside offered a plastic bottle-only service, with the remaining 26% offering collection services for non-bottle rigid plastic packaging (pots, tubs and trays only) or mixed plastics packaging (including plastic films).

Key messages for local authorities

In order to get a good understanding of each local authority’s plastic bottle recycling performance it is recommended that WRAP’s kerbside dry recycling performance benchmarking tool is used (<http://labenchmark.wrap.org.uk/>). This shows the latest analysis of national datasets and the breakdown by ONS/nearest neighbour group.¹⁰

10. [Waste & Resources Action Programme \(2011\) Dry Recycling Performance Benchmarks](#)

Figure 7 Breakdown of the percentage and quantity of plastic packaging collected via scheme type (2009–2010)



Source: Recoup (2010) UK Household Plastic Packaging Collection Survey 2010, www.recoup.org/business/default.asp; and Recoup (2011) UK Household Plastic Packaging Collection Survey 2011, presentation delivered by Stuart Foster, Deputy CEO of Recoup.

Case Study Two

Kingston upon Thames

<p>Refuse:</p> <ul style="list-style-type: none"> 180-litre wheeled bin for households with up to five residents – 240 litre for households greater than five (flats receive a 240 to 820 litre wheelie or bulk bin) – collected fortnightly. <p>Recycling (kerbside sort scheme):</p> <ul style="list-style-type: none"> One 55 litre box for plastic bottles, paper, glass bottles/jars, cans/tins, textiles and shoes, food and drink cartons, batteries – collected weekly. Cardboard stored in white bag and collected weekly. Food waste is collected weekly from a 23 litre caddy (residents are provided with a 5 litre caddy for indoor use). <p>240 litre wheeled bin for garden waste (charged service) – collected fortnightly.</p>	<p>The majority of households in Kingston upon Thames are serviced by a kerbside sort scheme (45,000); while a smaller number have their dry recyclables collected co-mingled (6,000). Overall, recycling/composting performance was 46.16% in 2009/10 (against an average in England and London of 39.7% and 31.8% respectively). In 2009/10 a total of 732 tonnes of plastic bottles were collected via the kerbside sort collection service, which amounted to an impressive 16.28 kg per household over the year.</p>	<p>The authority rolled out a new service in 2008 and at first experienced a few issues with contamination. However, this was soon remedied by an effective communications programme. The authority has a strict approach to contamination and rejects any contamination at the kerbside with a contamination sticker. An example of the authority's online communication sheet is shown in Appendix B.</p>
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Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices	Contents
												Guide page 30

Case Study Three

London Borough of Redbridge	
<p>Service Description</p> <p>Refuse:</p> <ul style="list-style-type: none"> Residual waste collected in sacks on a weekly basis. <p>Recycling (two-stream):</p> <p>Two 55l boxes collected weekly:</p> <ul style="list-style-type: none"> first for tins/cans, glass bottles/jars, and plastic bottles (no other plastics); and second for paper and card. <p>Collections completed by contractor: Enterprise.</p>	<p>In 2009/10 and 2010/11, using a two-stream collection scheme, the authority collected 1,745 and 1,798 tonnes of plastic bottles, respectively. In 2009/10 plastic bottles constituted 13% of the kerbside dry recycling, or 18.05 kg per household over the year (assuming collection from 96,688 households – collections increased from 94,221 households in the first quarter to 99,155 households in the fourth). In 2009/10 the authority achieved an overall recycling rate of 31.6% (average for London was 31.8%), up from just 7% in 2000/1.</p> <p>The council started collecting plastics at the kerbside in 2004. Initially, this service was provided on a fortnightly basis and in 2007 weekly collections commenced. When introducing a second box for the collection of card (the authority started out with one recycling box) the council undertook a comprehensive communication campaign, consisting of leaflets and an extensive doorstepping campaign. The authority is now using Recycle Now iconography, a borough magazine, and occasional doorstepping campaigns to promote recycling within the area. It does not accept contaminated boxes and leaves a note highlighting unacceptable levels of contamination when it occurs. This leads to a reported contamination level of just 2% at the sorting phase.</p>

						Household						Contents
Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design		Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices	Guide page 31

A reprocessor's perspective

Whilst there is not a consistent view on what local authorities should be doing with regard to household communications, there are some emerging themes that several reprocessors have expressed:

- authorities should send out a clear message that all plastic bottles (regardless of polymer) can be recycled; and
- bottle tops are not a problem.

Table 4 highlights a number of other quality issues that are of concern to reprocessors and should be borne in mind when devising communication schemes on plastic bottles. Some are more relevant than others, and the ease with which they can be tackled may also vary widely, depending on local conditions and openness to change.

It should be borne in mind that local authorities may not be best placed to resolve the issues highlighted, but they might be useful when considering messages to service users.

Table 4 Quality issues raised by reprocessors

Reprocessor quality issue	Action
Elevated levels of non-target plastic items (i.e. items other than plastic bottles)	Take actions to improve MRF management or feedback to householders receiving multi-stream services.
The presence of PVC bottles	This is largely a problem for the packaging industry to be aware of. Whilst the presence of PVC bottles is an issue, it is still felt that a clear message to householders that all bottles (regardless of polymer) can be recycled is the most appropriate action for the local authority.
Milk bottles containing milk contaminants, leading to flies, maggots and higher washing costs	Local authorities could make service users aware of the problem through on-going communications.
Soft drink bottles surviving with contents, which are finally released in PRF processes, causing higher machinery maintenance costs (carbonic acid is a strong corrosive)	Local authorities could make service users aware of the problem.
The presence of natural HDPE detergent bottles	This is largely a problem for the packaging industry to be aware of. Whilst the presence of natural HDPE detergent bottles is an issue, it is still felt that a clear message to householders that all bottles (regardless of polymer) can be recycled is the most appropriate action for the local authority.
Elevated levels of dirt and grease	This can be addressed through improved MRF management and on-going communications with households.
PVC labels on PET bottles	This is largely a problem for the packaging industry to be aware of.

Table 6 Project Integra. An example of good practice in contamination monitoring and control

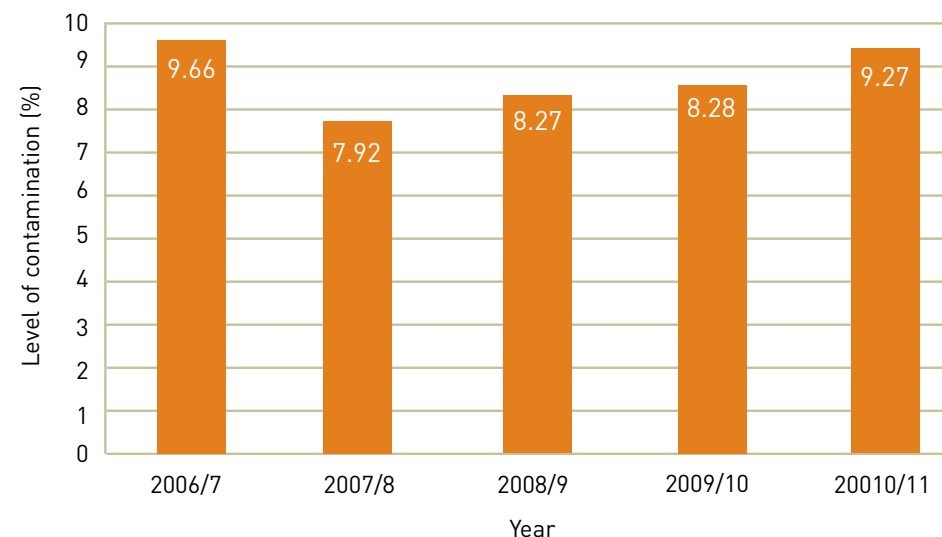
Project Integra's Material Analysis Facility: A case study

Background

Project Integra is a partnership between all of the district authorities in Hampshire, Hampshire County Council, the unitary authorities of Portsmouth and Southampton, and Veolia Environmental Services. All 750,000 households served by Project Integra can access a co-mingled service for paper, card, aluminium and steel cans, aerosols and plastic bottles. In order to maximise income and improve the environmental benefits gained from the region's recycling services, Project Integra has taken active steps to reduce contamination. Key to this was the development of a material analysis facility (MAF) in the spring of 2006. This facility, operated by Veolia Environmental Services, is attached to Alton MRF, one of two MRFs operated by the partnership in Hampshire (together the two MRFs process 157,000 tonnes of dry recyclables a year). The MAF was designed to fulfil three main tasks:

- **analysis of incoming co-mingled dry recyclables** – to allow assessment of incoming material quality in relation to the input specification of the facility, apportionment of contamination across the partners and the identification of low-performing areas;
- **analysis of other streams** – for example, the analysis of residual waste (allowing capture rates to be estimated), and the analysis of the reject stream from the two MRFs (which supported the development of a business case for adding magnetic and eddy current separation to this conveyor in order to separate smaller metal items); and
- **analysis of outgoing sorted materials** – to ensure that quality standards of outgoing products are maintained and sales values optimised.

Alton MRF was opened in 2005 and the MAF was commissioned soon after. Initially contamination declined (from 9.66% in 2006/07 to 7.92% in 2007/8), but then increased slowly year on year until reaching 9.27% in 2010/11 (see bar chart below). It is worth noting, however, that the increase in 2010/11 is most likely due, at least in part, to a change in the sampling procedure used to measure contamination levels. As described below, the sampling methodology was modified in 2010/11 to enable greater flexibility and to ensure that more detail could be captured.



APPENDIX A: PLASTIC BOTTLE GRADES

Typical grades of plastic bottles post-PRF/MRF

Plastics polymers (predominantly HDPE and PET) are typically sorted using automated and manual sorting techniques. Manual sorting of the different plastic polymers is reported to be most prevalent in the UK, with optical sorting used in MRFs with large throughputs (i.e. where the cost of installation can be justified).¹⁹ There is no one complete list of products produced by PRFs and MRFs. MRFs in particular vary considerably in the type and combination of products that are produced. However, typical post-PRF/MRF plastic grades are as follows (and illustrated in Figure 10):

- **Clear PET bottles** – mostly derived from beverage containers, such as soft drinks and mineral water. Their commercial value means that they are frequently separated out. After sorting the final baled products frequently contain between 2.6% and 9.5% non-target items.²⁰
- **Coloured PET bottles** – mostly derived from beverage containers and other household food and cosmetic products; final baled products frequently contain between 5.6% and 10.7% non-target items.
- **Coloured HDPE bottles** – typically used to make shampoo and laundry detergent bottles. Final baled products frequently contain between 6.9% and 11.3% non-target items.
- **Natural HDPE bottles** – mostly used for the storage of fresh milk. Their value in combination with efficient sorting ensures low levels of contamination in the final baled product (median lies between 1.9% and 4.0% of non-target items).

19. [Waste & Resources Action Programme \(no date given\) Recovering Value from MRFs,](#)

20. [Figures on contamination presented here and immediately below come from median figures presented in: ENVIROS \(2009\) MRF Quality Assessment Study, Report for the Waste & Resources Action Programme, November 2009,](#)

- **Non-bottle rigid plastic packaging** – typically comprises plastic pots, tubs and trays. This material category specifically excludes plastic bottles, construction plastics, foamed plastics, flexible plastic films and bulky household items such as washing up bowls and toys.
- **Plastic films** – these are typically manually sorted and include a variety of plastic polymers, the most common being low-density polyethylene (LDPE). Other materials include bags and wrappings used for food and other household goods.

Figure 10 Examples of different commonly used plastic polymers and their products. A. Clear PET used for mineral water; B. Coloured PET used for common household products; C. HDPE natural used for milk containers; and D. mixed plastic packaging consisting of various plastic polymers



											Appendices	Contents
Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary		
												Guide page 43

In MRFs it is not uncommon for this list to be reduced to a small number of product streams such as, rigid household plastic packaging and plastic films. In some MRFs, further sorting occurs to extract the more valuable streams such as Clear PET and Natural HDPE, leaving behind a mixed plastic packaging stream (with a low content of valuable items) and plastic films. The larger MRFs commonly produce the full range of materials listed above; a few examples of the baled products are shown Figure 11.

Figure 11 Examples of different MRF outputs. A. HDPE Natural; B. Clear PET; C. rigid household plastic packaging; and D. plastic film²¹



21. Figures taken from: Sante Fe Solid Waste Management Agency (2009) [Plastics Recycling Info](#), date accessed: 20 October 2011 and Nextek Ltd (2009) [Commercial Scale Mixed Plastic Recycling, Report for the Waste & Resources Action Programme, June 2009](#)

APPENDIX B: EXAMPLE COMMUNICATIONS

Examples of household communications

Examples of communications used by two case study authorities are provided in Figure 12 and Figure 13.

Figure 12 Example of communication leaflet provided by Kettering Borough Council



Source: [Kettering Borough Council, What Goes Where? Information on what should go in each bin.](#)

Figure 13 Example of online refuse and recycling details provided by the Royal Borough of Kingston upon Thames



Source: [Royal Borough of Kingston upon Thames \(2011\) A to Z of Recycling in Kingston](#)

Introduction	Structure of this guide	Policy context	Market context	Plastic bottle collection	Scheme design	Household	Point of collection	Post-collection sorting	Material Recycling Facilities	Glossary	Appendices
--------------	-------------------------	----------------	----------------	---------------------------	---------------	-----------	---------------------	-------------------------	-------------------------------	----------	------------

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Contents

