

# **Characteristics of Retail Waste Logistics on Winchester High Street**

**Initial findings from the High Street Business Managers Survey**

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## **Key Findings**

A survey of 69% (n=83) of the 120 businesses on Winchester High Street revealed the following about their delivery vehicle activity and returns management processes:

### **Waste composition**

1. Three different waste management systems are used by High Street businesses where waste/recyclate is i) collected by waste contractors, ii) back-loaded via delivery vehicles and/or iii) taken to a household waste recycling centre.
2. 67% of the waste produced by businesses consisted of cardboard and paper (comparable to the findings from a survey in 2005).
3. Since 2005, the results suggested that there had been an increase in the proportion of cardboard produced by footwear (up 73%) and mobile phone retailers (up 26%).

### **Waste contracted collections**

4. 74% of businesses used waste contractors to handle all their waste arisings.
5. On average, each business in the sample received 2.4 waste collections per week.
6. The total number of residual waste collections generated by the whole High Street (excluding financial institutions) could be in excess of 208 per week.
7. Charity shops received significantly more waste collections (6.3 on average).
8. Only 23% of businesses actively separated out key waste streams and subsequently received two or more dedicated collections per week.
9. The number of waste collections conducted on Mondays and Wednesdays on the High Street contributed to 47% of the weekly total.
10. 49% of the High Street businesses had residual waste collected from bins with 33% using plastic sacks as part of contractual agreements with the waste collection companies.
11. 1100 litre bins were used by 70% of bin users with only 5% using 240 litre bins.
12. From 107 of the High Street businesses, it was estimated that approximately 308,000 litres of residual waste is presented for collection during a typical week (bin equivalent volume). Over 14 contractors collected waste and recyclate from 74 businesses on Winchester High Street.
13. Residual waste was collected predominantly by Serco (47%) or Biffa (38%).
14. Of the businesses that received dedicated cardboard collections, approximately 45% had arrangements with Biffa.
15. 76% of residual waste collections were conducted during the morning before 12:00.
16. 64% of businesses did not receive any dedicated collections for recyclate and disposed of all their waste into the same receptacle. (This could contain un-separated mixed waste (e.g. dry recyclate (cardboard, textiles, glass, plastic, paper), putrescible wastes (food, green waste)) implying that no recycling was done at source.
17. Businesses identified cost of extra collections (36%) and lack of separation and storage space inside and outside (33%) as the main factors impeding their recycling performance.

### **Collection systems used by waste contractors**

18. Details of the collection systems used by 4 contractors (Contractors A to D) responsible for over 90% of residual waste collections on the High Street were explored.
19. Contractors do not have enough customers on the High Street to generate a whole collection round and therefore the collection vehicle services businesses in surrounding towns and villages.
20. Contractors provided a flexible collection service (scheduled and on-demand collections) for residual waste which easily accounts for both expected and sudden increases in waste production (except Contractor D).
21. Contractors used RCVs which were only able to collect one waste stream at a time.
22. Each round started at the contractors' vehicle depot which were located between 23 and 33 kilometres from Winchester (except Contractor B whose depot was located in Winchester).
23. Collections from the High Street were completed early on in the collection rounds primarily due to the traffic issues in and around the city (except for Contractor B who collected waste in cycles).
24. The frequency with which waste/recyclate was collected from Winchester High Street businesses varied between contractors (2 to 6 collections per week).
25. The capacity of RCVs within the fleet of collection vehicles enables them to collect between 4.5 to 13 tonnes of residual waste.
26. Tipping typically occurred once per day at the end of the round.
27. Residual waste was typically disposed of within Hampshire (except Contractor D where it was taken after being sorted to a landfill site in Swindon).
28. Due to the economic downturn, the fill rates of the vehicles and tipping ratios have been reduced.
29. Contractors collecting recyclate (cardboard or commingled e.g. mixed unseparated recyclate) offered a limited service where collections were only made on one day each week.
30. Costs of disposal, legal restrictions, contractual obligations (which may require a specific facility to be used e.g. Otterbourne transfer station by the city council's contractor), proximity of facilities, and also the availability of own, in-house disposal facilities, were all factors that impacted on the collection systems and disposal options used by each business.

### **Back-loading using reverse logistics networks**

31. 8% of businesses back-loaded all waste/recyclate produced using delivery vehicles.
32. On average, each business in the sample back-loaded waste/recyclate 3 times per week.
33. 2 stores back-loaded each weekday, Monday to Friday.
34. Businesses own fleets of delivery vehicles (mainly vans) were used to back-load the waste.
35. 18% of businesses use a combination of back-loading and a waste contractor
36. A total of 58 waste collections per week (including back-loading) were generated by 11 businesses that used 2 different collection systems of which 55% were for residual waste contracted collections.
37. In addition to businesses own vehicles which were used in 67% of recyclate back-loads, logistics providers (UPS, Tibbett and Britten, TNT) and suppliers (King, AAH) were also mentioned.

## **Backloading operational systems**

38. Detailed surveys were conducted with a health and beauty retailer (Retailer A), and 2 clothing retailers (Retailers B and C) to understand the operational procedures involved with back-loading waste and recyclate.
39. Each business used a combination of 2 collection systems in which recyclate was back-loaded and residual waste collected by a waste contractor (except Retailer C that did back-load some residual waste in addition to receiving residual waste collections).
40. Each retailer took advantage of their centralised distribution systems to channel recyclate back on their delivery vehicles.
41. Cardboard, paper and plastics were the main types of materials separated in-store and back-loaded on to business own delivery rigid or artic vehicles.
42. It was considered to be more cost effective to separate waste in store than at the distribution centre and it also generated a better quality of recyclate.
43. By back-loading recyclate, retailers are able to add value to an otherwise empty return journey back to the distribution centre.
44. Legal responsibilities (including Packaging Waste Regulations) provide businesses with an incentive to utilise reverse logistics networks to improve their recycling performance.
45. Collections from Winchester were typically part of multi-drop delivery rounds in which up to 2 other deliveries/collections were made per route.
46. The frequency of deliveries and ability to back-load varied between each retailer (once a week to daily Monday to Saturday).
47. Retailer A and B, both received equal numbers of contracted and back-loaded collections each week e.g. Retailer A back-loaded on 6 delivery vehicles and received 6 residual waste collections.
48. Each round started at the contractors vehicle depots which were located between 23 and 33 kilometres from Winchester (except Contractor B whose depot was located in Winchester).
49. The distance travelled per delivery round varied between retailer depending on the location of other businesses on the round and the location of the DC (ranged between 93 to 344 kilometres).
50. After back-loading all recyclate to the DC in Basingstoke, Retailer A separated cardboard and back-loaded other recyclate to the main DC in Nottingham.
51. Each retailer was able to back-load recyclate from the majority of their branches in the UK due to having their own dedicated vehicle fleet, spare capacity on the vehicles and also adequate facilities at the distribution centres.
52. All waste/recyclate was back-loaded to facilities outside of Hampshire.

## **Household waste recycling centres**

53. 10 businesses (12%) stated that they used local Household Waste Recycling Centres (HWRCs) to dispose of specific waste streams (specifically cardboard and fluorescent tubes).
54. It is estimated that it costs over £1 million/year in disposal costs and landfill tax charges to dispose of trade waste illegally taken to Hampshire HWRCs.
55. Despite being illegal within Hampshire, there are examples of HWRCs within the UK that enable traders to dispose of residual and/or recyclate waste at a cost.

## **Sustainable approaches to retail waste collection in an urban centre**

### ***Coordinated take-back***

56. Utilising the existing delivery mechanisms serving a retail centre to take-back recyclate has the potential to reduce the transport footprint associated with waste management in urban centres.
57. It has been estimated that each business generates an average of 1299 litres (ranging from 0 to 10340 litres/week) of cardboard each week or 1.23 roll cage equivalents.
58. From these projections it is estimated that 139,007 litres of cardboard or 131 roll-cage equivalents could be produced each week by the businesses on the High Street.
59. A DfT survey of 22 vehicle fleets estimated that 26% of a typical delivery vehicles deck area would be free after completing a delivery.
60. A minimum of 15 vehicle trips per week/3 per weekday (Monday to Friday) would be required to collect 131 roll cages of cardboard.
61. A take-back scheme might not be required for the whole street.
62. With a reduced number of 28 businesses participating in the scheme, 4 vehicle trips may only be required to collect 38 roll cages of cardboard each week. Such a scheme could potentially be managed by a single business with an appropriate infrastructure.
63. Peak trading periods could see a doubling of the waste output from some retailers and this could have a significant impact on the number of vehicles required during the October to December period.
64. 45% of businesses stated that they would consider collaborating with their neighbours in terms of recyclate management.

### ***Combined commercial and domestic collections***

65. In addition to providing a domestic waste collection service, Local Authorities may offer a commercial waste collection service which uses a dedicated vehicle fleet and operates as a completely separate entity.
66. Within the UK there are a few examples of waste collection authorities facilitating the collection of domestic and commercial waste as part of the same collection round.
67. For recyclate collection, this appears to be a much more efficient use of transport resources as domestic and retail areas can be covered using the same vehicle fleet as part of the same round.
68. The New Forest District Council (NFDC) operates a joint commercial/domestic waste collection service, allowing SME's to put out recyclate for collection as part of the domestic round.
69. Such a system is ideally suited to High Street businesses who may be producing small quantities of cardboard and do not want to sign up to a large scale commercial collection service.
70. The ability of an existing domestic round to collect additional waste is dependent on the spare capacity in the refuse collection vehicle (RCV) and the amount of time available for collecting due to the time constraints associated crew shift patterns and the operating hours of waste treatment/disposal facilities. This has been examined in detail as part of a separate case study in Winchester.

## 1 Winchester case study methodology

The main aim of this research was to review the current waste management procedures employed by businesses in Winchester High Street, identify examples of best practise and explore opportunities for more collaborative approaches to improve sustainability. This report:

- Reviews the range of current techniques used to manage and collect waste (e.g. collections and back-loading of waste on delivery vehicles).
- Quantifies the frequency of collections per waste type and identifies the waste contractors employed in each case.
- Quantifies the types of receptacles used on the High Street and the volumes of waste collected per week.
- Identifies current operational issues experienced by retailers.
- Investigates the potential of more sustainable approaches to retail waste collection in an urban environment.

There are 120 businesses on Winchester High Street, of which 83 (69%) were involved in the survey (Table 1, Figure 1). An interview based questionnaire was directed to 107 store managers, excluding all banks and building societies. The decision to exclude these institutions from the survey was due to the sensitive nature of their deliveries and returns data. Experience from previous surveys suggested that such institutions would not be able to provide the information required. Each business was visited by a member of the research team to conduct the interviews which were targeted at the business manager. The surveys took place between April and June 2008.

**Table 1:- Businesses on Winchester High Street**

<b>Business Categories</b>	<b>Total no. businesses</b>	<b>No. Businesses surveyed</b>	<b>% Surveyed</b>
Banks/Building Societies	13	0	0
Charity shops	4	4	100
Clothing Retail	17	15	88
Food/drink	9	6	67
Footwear	4	3	75
Jewellers	6	6	100
Mobile Phones	7	6	86
Opticians	5	3	60
Other Retail	34	28	82
Other Services	14	8	57
Public house/restaurant	7	4	57
<b>Total</b>	<b>120</b>	<b>83</b>	<b>69</b>

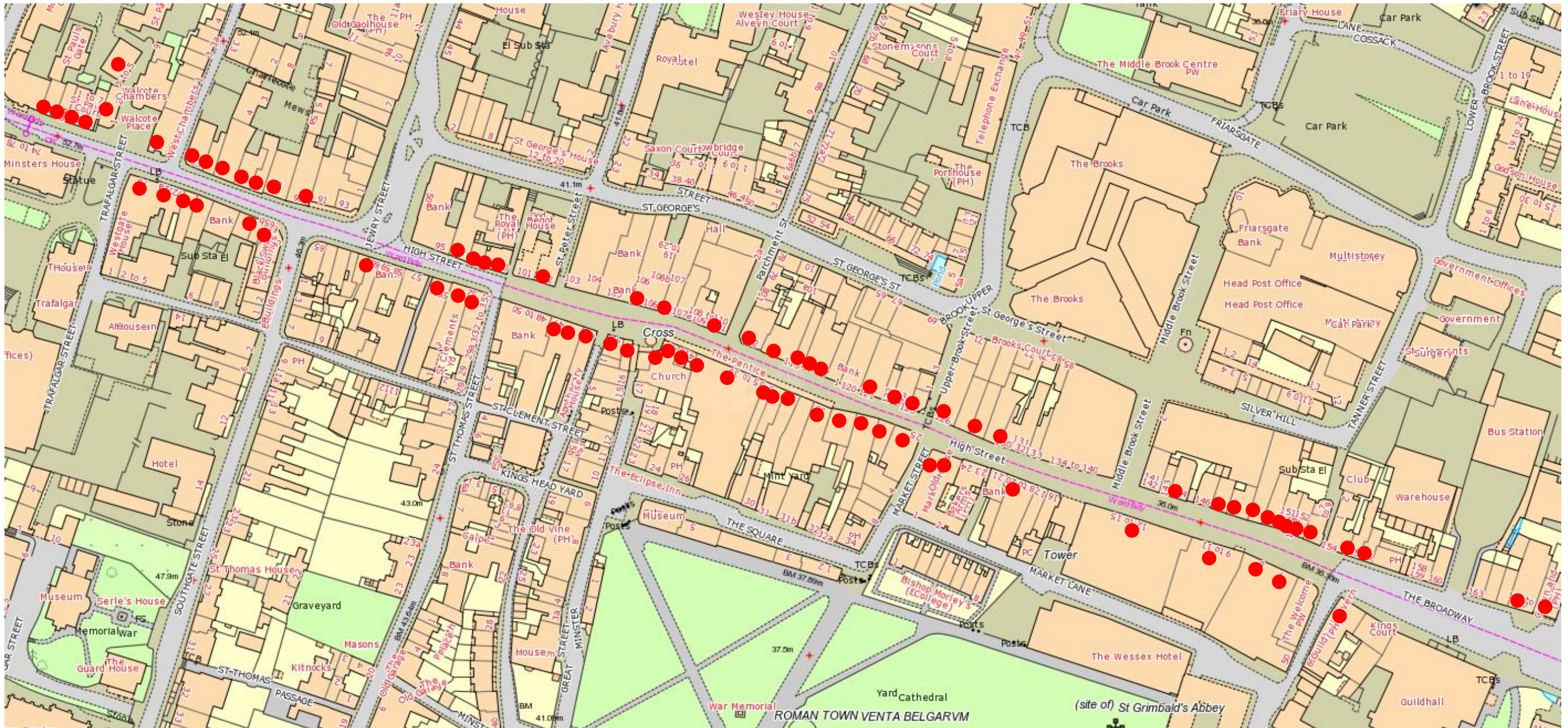


Figure 1:- Distribution of participating High Street businesses

In order to draw comparisons between similar businesses, all High Street business were classified depending on their main activity (Table 2).

**Table 2:- Business categories identified on the High Street**

<b>Business Category</b>	<b>Description</b>
Banks and Building Societies	Includes all financial institutions e.g. banks, building societies, or credit unions
Charity Shops	Includes any retailer selling goods from which all profits are donated to a designated charity
Clothing Retailers	Includes any retailer where the main core goods sold are mens, womens and/or childrens clothing
Food/drink	Includes any retailer selling food and/or drink which can be consumed on or off the premises e.g. cafes, bakers
Footwear	Includes any retailer where the main core goods sold are mens, womens and/or childrens footwear
Jewellers	Includes any retailer where the main core goods sold are jewellery and related accessories (e.g. watches)
Mobile Phones	Includes any retailer where the main core goods sold are mobile phones and related accessories
Opticians	Includes any retailer where the main core goods sold are ophthalmic lenses and eyeglasses
Other Retail	Includes department stores and any retailer where the main core goods sold are haberdashery, toys, entertainment (DVDs, games), electrical goods, bookshops, outdoor equipment, pharmaceuticals, cosmetics, stationary etc.
Other Services	Includes any business which provides a service e.g. estate agents, travel agents, insurance companies, reprographics
Public houses and restaurants	Includes any outlet serving food which is also licensed to sell alcoholic beverages

The overall participation rate for the interview questionnaire was 78% (taken from the 107 businesses that were initially approached). Across the different business categories, 100% response was obtained from charity shops and jewellers with the lowest response rate recorded for pubs and restaurants (57%). Time constraints, lack of senior management on site and approval required from head office were the main reasons why businesses did not participate in the questionnaire.

### **1.1 Interview Questionnaire**

The interview questionnaire consisted of four sections which investigated and quantified the vehicle movements associated with core goods deliveries and service visits, handling and managing customer and stock returns, and waste management. Current operational issues were also identified in addition to attitudes and opinions towards potential collaborative waste management approaches. There are a large number of clothing retail outlets (13% of the total establishments), which make up 18% of those premises surveyed. Of the 28 'other' retailers, 7 were retailers of electronic and other entertainment (CDs, DVDs, computer games and traditional toys), 4 were

cosmetics or pharmaceutical retailers, 4 sold greetings cards and stationery, 3 were retailers of outdoor and sports clothing and accessories. Of the 10 remaining, one sold electronics goods and one was a large department store.

Section 3 of the questionnaire gathered information on current waste management procedures employed by businesses on Winchester High Street. To estimate what proportion of freight vehicles were associated with waste management, businesses were asked to quantify the number and characteristics of different waste collections they received during a typical week (frequency of collection by waste type, names of contractors used, storage and separation techniques). The typical composition of waste (e.g. cardboard, paper, plastic, glass, chemicals and electrical and electronic equipment) produced by businesses was also obtained and factors impacting on recycling performance identified.

## 2 Waste composition

Businesses were asked to identify the materials that formed their typical weekly waste output, and estimate the approximate percentage that each category contributed (Table 3).

**Table 3- Waste composition data available**

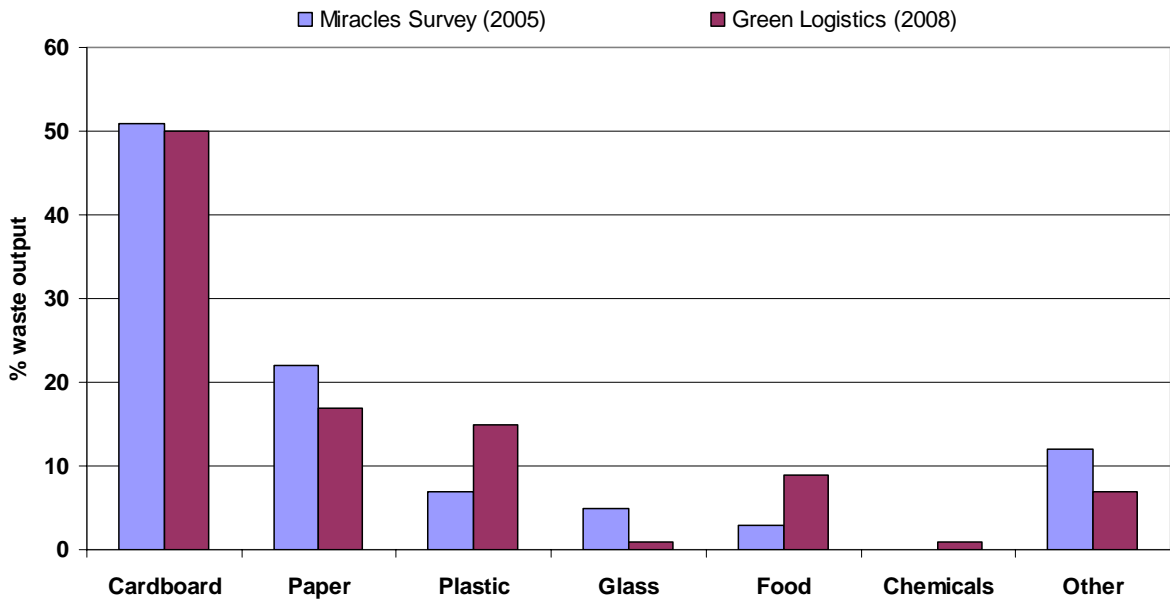
<b>Business Categories</b>	<b>Total No. participants</b>	<b>Waste composition data available</b>	<b>% of participants</b>
Charity shops	4	4	100
Clothing Retail	15	15	100
Food/drink	6	4	66.7
Footwear	3	3	100
Jewellers	6	6	100
Mobile Phones	6	5	83.3
Opticians	3	3	100
Other Retail	28	23	82.1
Other Services	8	5	62.5
Public house/restaurant	4	4	100
<b>Total</b>	<b>83</b>	<b>72</b>	<b>86.7</b>

From across the business categories in the sample, 87% provided an estimate of the types of waste produced by their business activity during a typical non-peak trading week and mean production figures were derived for each business category from the responses gained. Similar estimates were obtained from 69 High Street businesses as part of the EU MIRACLES project (2005). Comparisons between these two data sets were used to indicate how waste production may have changed over the 3 year period (Figure 2). It should be remembered that these data have been derived from the store managers and represent estimates of waste production. A true picture can only be derived using the weights of waste produced across the various contractors used but this can be problematic due to the confidential nature of the information.

Both surveys identified that a significant proportion of the waste produced by the average business on Winchester High Street consisted of cardboard (50%) and paper (22% in 2005 and 17% in 2008) which could be recycled. These results are comparable with other retail waste surveys conducted at Westminster (SWAP, 2002), Cardiff City Centre (Keep Wales Tidy and ESRC BRASS, 2004) and Northern Ireland

(Environment and Heritage Services, 2002) which indicated that these types of recycle are typically derived from packaging.

Although there appears to have been an overall reduction in the proportion of paper produced from 22% (Miracles, 2005) to 17% (Green Logistics, 2008), cardboard continues to account for approximately 50% of all waste generated from the High Street businesses. Paper waste could have been reduced during this period as more businesses change over to electronic transactions (e.g. for ordering, proof of delivery, correspondence (email)) to improve operational efficiency. Plastics and food wastes (a combination of out of date foods, left over food and food waste from staff) have more than doubled during this period although the exact reasons for this are unclear.

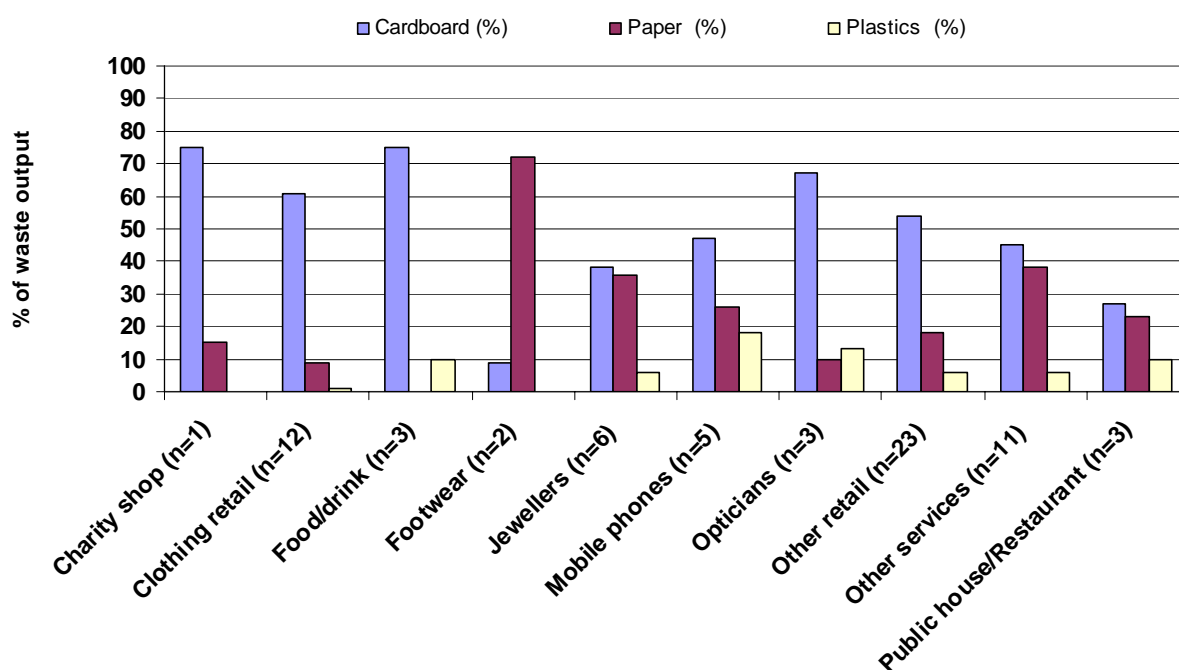


**Figure 2:- Composition of waste generated by Winchester High Street businesses (2005 sample = 69 businesses, 2008 sample = 72 businesses)**

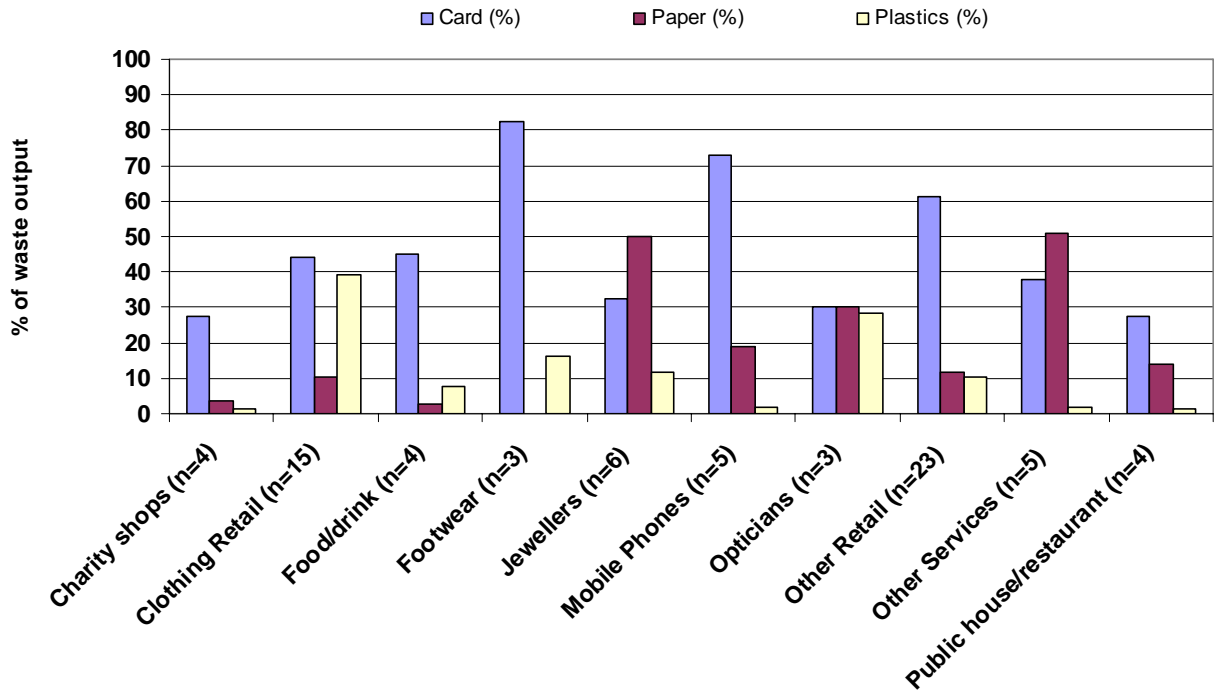
Table 4 contains a breakdown of the waste types produced by each business category for the 2005 and 2008 surveys. It is evident that for the majority of business categories (except jewellers, other retail, other services and public houses/restaurants) there has been an apparent shift in the production of cardboard during the 3 year period (Figures 3 and 4). Cardboard generated by charity shops, clothing retailers, food/drink retailers and opticians has in each case decreased with the biggest reduction being recorded in charity shops (down 47% from 75% to 28%). Such changes could be in response to the EC directive on Packaging and Packaging Waste (94/62/EC), in which cardboard transit packaging may have been replaced by reusable alternatives. Despite this shift, the store manager surveys suggested that there had been an increase in the proportion of cardboard produced by footwear (up 73%) and mobile phone retailers (up 26%), although the amount of paper produced had reduced since 2005 for both business categories. Decreases in paper production were also observed across the charity shop, other retailer and public house/restaurant categories. Plastic production appears to have increased in the clothing retail, footwear, jeweller and optician categories further highlighting the potential switch to plastic packaging. Recyclate weight data from the contractors, relevant to each business group would be required to confirm these findings.

**Table 4:- Percentage waste composition by business category by waste type for 2005/2008 Winchester High Street business managers surveys. (2005 sample = 69 businesses, 2008 sample = 72 businesses)**

Business Categories	Card (%)	Paper (%)	Plastic (%)	Food (%)	Glass (%)	Chemicals (%)	Other (%)
Charity shops	75/28	15/4	0/1	5/0	0/0	0/0	5/68
Clothing Retail	61/44	9/11	1/39	5/5	16/0	0/0	8/1
Food/drink	75/45	0/3	10/8	3/39	0/0	0/0	12/6
Footwear	9/82	72/0	0/16	0/0	1/0	0/0	18/2
Jewellers	38/33	36/50	6/12	3/4	1/2	0/0	16/0
Mobile Phones	47/73	26/19	18/2	0/6	0/0	0/0	8/0
Opticians	67/30	10/30	13/28	0/10	0/1	0/0	10/0
Other Retail	54/61	18/12	6/10	3/8	4/0	0/3	16/6
Other Services	45/38	38/51	6/2	2/8	0/0	0/0	8/1
Public house/restaurant	27/28	23/14	10/1	7/23	27/13	0/10	7/13
Total waste output (%)	51/50	22/17	7/15	3/9	5/1	0/1	12/7



**Figure 3:- Production of cardboard, paper and plastics by business type based on 2005 estimates (n=sample size)**



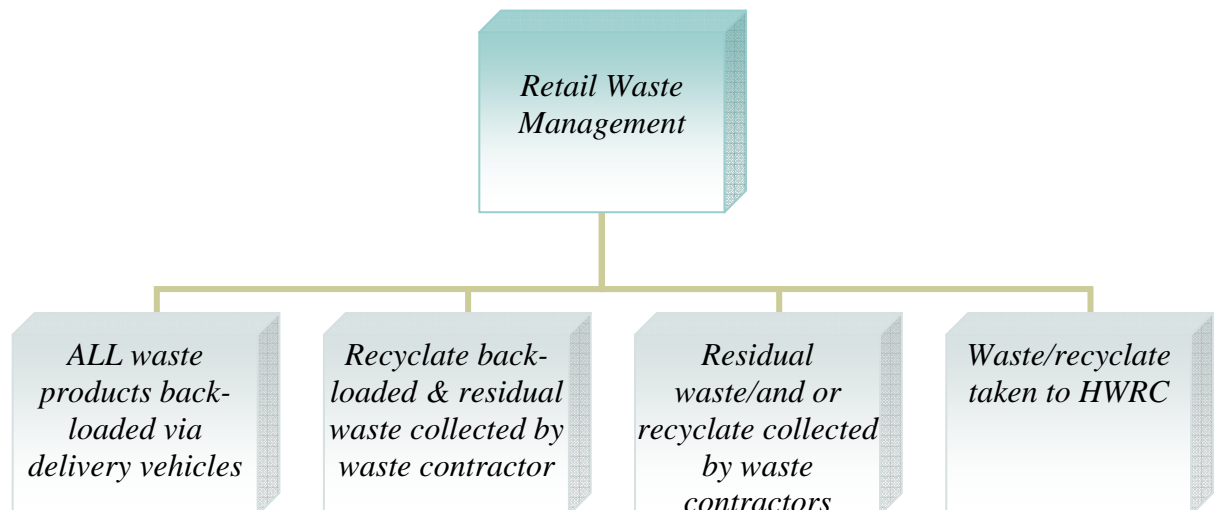
**Figure 4:- Production of cardboard, paper and plastics by business type based on 2008 estimates (n=sample size)**

### 3 Overview of waste logistics operations

An initial review of waste management procedures across the respondents from the High Street identified that 3 “main” waste collection systems were employed although there were some variants (Figure 5):-

- Businesses buy in the services of a waste contractor (Individual or company) who takes waste/recyclate away for disposal/treatment and potentially generates revenue from it by selling it on to other collection/re-processors (74%)
- All waste and recyclate generated is back-loaded on scheduled delivery vehicles to distribution centres, head offices or other facilities in the supply chain (8%)
- Waste and recyclate is collected by both waste contractors and by back-loading supply chain vehicles (18%)

In addition to these main systems, 1 business disposed of all waste at local household waste and recycling facilities, contrary to current guidelines. For the purposes of this report, the characteristics of the three different systems are discussed in detail separately.



**Figure 5:- Summary of waste management systems used by businesses on Winchester High Street**

## 4 Collections by waste contractors

This section of the report discusses the characteristics of the 74% of Winchester High Street businesses who employed waste contractors to collect their waste and recycle.

### 4.1 Weekly waste collections

Businesses were asked to provide a breakdown of the number of waste collections received per week by waste category and from this, mean figures were derived for each business type. Separate analyses were undertaken looking at the relationship between the size of the retail sales area of the business and the number of collections received and potential volumes of waste produced (based on bin capacity).

Of the 66 businesses that provided data, 159 waste collections were generated per week (2.4 per business on average), Table 5, with the highest and lowest number of collections being made from the 25 '*other retail*' (47) and 4 '*services*' (5) business categories respectively. As collection data were obtained for only 1 of the 7 *opticians* on the High Street, this business category was omitted from this part of the analysis as the data are unlikely to be representative of the whole business category. The zero minimum values observed in the *food/drink*, *footwear*, *other retail* and *other services* categories are derived from 8 businesses that stated that they back-loaded all their waste using delivery vehicles and therefore did not receive any contracted waste collections.

**Table 5:- Mean number of waste collections per week by business category for business on Winchester High Street**

Business Categories	Sample	% Total businesses	Total No. weekly collections	Mean No. collections per week	Min	Max	Stdev
Charity shops	4	100	25	6.3	6	7	0.5
Clothing Retail	12	70.6	26	2.2	1	4	1.1
Food/drink	5	55.6	18	3.6	0	9	3.9
Footwear	3	75	7	2.3	0	6	3.2
Jewellers	4	66.7	6	1.5	1	2	0.6
Mobile Phones	4	57.1	9	2.3	1	3	1.0
Opticians	1	20	1	1	1	1	
Other Retail	25	73.5	48	2	0	6	1.5
Other Services	4	28.6	6	1.5	1	3	1
Public house/restaurant	4	57.1	13	3.3	2	7	2.5
<b>Total/mean</b>	<b>66</b>		<b>159</b>	<b>2.4</b>			

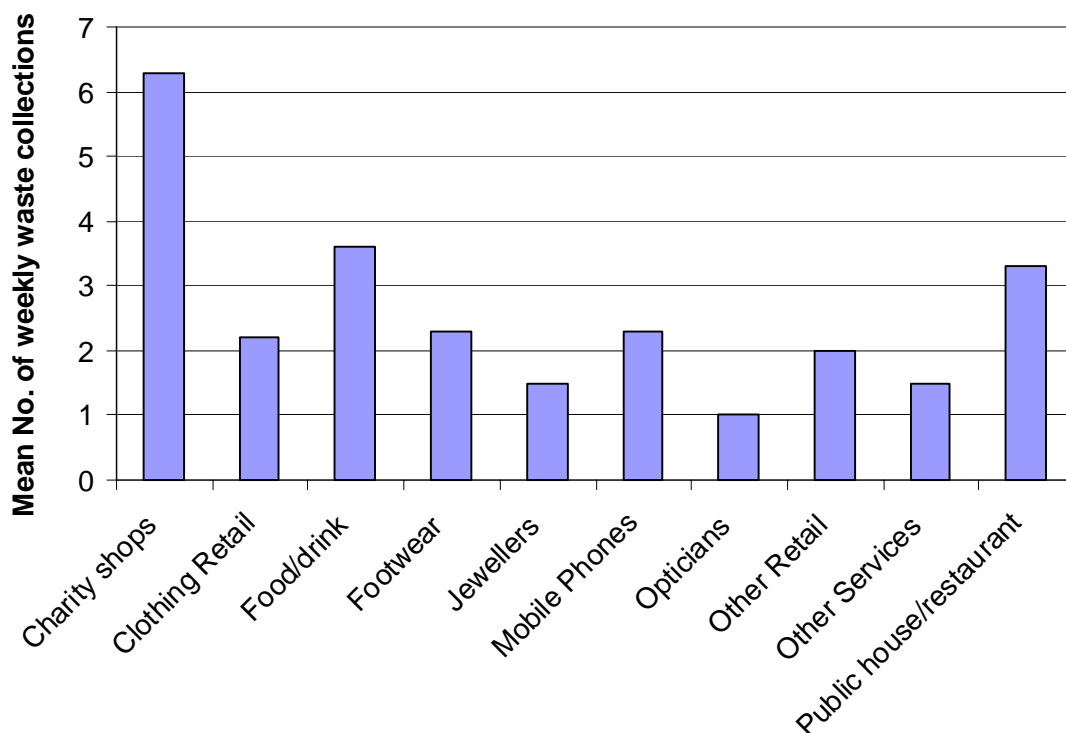
A one-way Analysis of Variance test showed that there were significant differences in the mean number of waste collections received by each business category per week ( $F_{(8,56)} = 3.17$ ,  $P=0.005$ ,  $Mse = 10.29$ ). Mean weekly collections ranged from 1.2 for the '*other services*' category to 6.3 collections per week for charity shops who, as a business category, recorded significantly more waste collections during a typical week (Figure 6). It is suggested that *charity shops* received a significantly higher mean number of waste collections per week due to the nature of the core goods sold

(donated second hand items). Charity shops receive deliveries of potential stock from a variety of sources, the saleability of which cannot be gauged until the items are inspected by staff. This process inevitably leads to waste generation as items donated with good intention are deemed un-sellable due to their particular characteristics. The 'other services' business category (including estate agents, travel agents) required fewer waste collections per week due to the nature of their primary operation (service provision).

The survey identified three different types of waste collection taking place in the High Street (Table 6) for:-

- *Residual waste* (which is used to describe un-separated mixed waste which can contain dry recyclate (cardboard, textiles, glass, plastic, paper), putrescible wastes (food, green waste)
- *Cardboard*
- *Other wastes* (e.g. textiles, batteries, oils)

Of the 159 collections generated by the 66 businesses that provided waste collection data, 85% were for residual waste and only 9% received dedicated collections for cardboard. Other waste streams which included textiles, oil and sanitary waste contributed to 6% of the total weekly collections. In addition to scheduled weekly collections, some businesses also received 'special collections' on-demand e.g. collection of fluorescent tubes, batteries and collection of old medicines.



**Figure 6:- Mean number of weekly waste collections by business category (Winchester High Street businesses)**

**Table 6:-Total number of weekly waste collections by business type and waste type for the 66 businesses on Winchester High Street who provided data.**

<b>Business Categories</b>	<b>Residual Waste</b>	<b>Cardboard</b>	<b>Other</b>	<b>Total No weekly collections</b>
Charity shops	18	0	7	25
Clothing Retail	22	4	0	26
Food/drink	14	4	0	18
Footwear	6	1	0	7
Jewellers	6	0	0	6
Mobile Phones	8	1	0	9
Opticians	1	0	0	1
Other Retail	45	3	0	48
Other Services	6	0	0	6
Public house/restaurant	9	2	2	13
<b>Total</b>	<b>135</b>	<b>15</b>	<b>9</b>	<b>159</b>

The number of dedicated cardboard collections recorded (9% of the total) was lower than expected. With the increased pressures on businesses to recycle, it was anticipated that more businesses would receive dedicated collections in order to meet legislative requirements. However as discussed in Section 5.2.3, businesses co-mingling their residual and recycle together in the same receptacle will meet the Producer Pre-Treatment Requirements, *if* the waste is to be treated at an energy-from-waste plant. The Producer Pre-Treatment Requirement of the Landfill Directive was implemented in October 2007, prohibiting businesses from sending non-hazardous waste to landfill which had not been pre-treated (Biffa, 2007). The responsibility for pre-treatment rests with the waste producer and the overall aim of the Directive is to reduce the impact of landfill and increase material recovery through recycling. Under the directive, 'pre-treatment' is deemed to have been undertaken when the waste has been through a 'three-point test' in which all three points have been satisfied:

- 1) It must be a physical, thermal or chemical, or biological process, including sorting;
- 2) It must change the characteristics of the waste,
- 3) It must do so in order to:
  - reduce its volume, or
  - reduce its hazardous nature, or
  - facilitate its handling, or
  - enhance its recovery.

In the case of a high street retailer, Pre-Treatment can usually be satisfied by separating out recyclable material from the residual waste stream using different containers or by sending mixed waste (where separation at-store is not possible) to a sortation facility where recycle can be recovered.

Each business category received dedicated collections of residual waste which accounted for between 72% (*charity shops*) and 100% (*jewellers, opticians and other services*) of their total weekly waste collections. Dedicated cardboard collections were recorded in 6 of the business categories contributing between 5% (other retail) and 22% (food/drink) of the total collections made to those particular business categories (Table 7). Section 6 discusses the number of businesses that back-load cardboard on delivery vehicles.

**Table 7:- Proportion of weekly waste collections by category and waste type**

<b>Business Categories</b>	<b>Mean No. collections per week</b>	<b>Residual waste (%)</b>	<b>Cardboard (%)</b>	<b>Other (%)</b>
Charity shops	6.3	72		28
Clothing Retail	2.2	84.6	15.4	
Food/drink	3.6	77.8	22.2	
Footwear	2.3	85.7	14.3	
Jewellers	1.5	100		
Mobile Phones	2.3	88.9	11.1	
Opticians	1	100		
Other Retail	2	93.8	6.3	
Other Services	1.5	100		
Public house/restaurant	3.25	69.2	15.3	15.4

*Charity shops, other retail and public house/restaurant* were the only business categories that received weekly collections of “other” waste streams. For *charity shops*, ‘other’ waste collections were concerned solely with textiles and books. The names of the contractors providing dedicated waste and recycle collections to High Street businesses are discussed in more detail in Section 4.7. The mean number for residual, cardboard and other waste collections by business category are summarised in Table 8. On average, *charity shops* received more residual waste collections per week (4.5), compared to the other business categories.

**Table 8:- Mean number of collections per week by business category by waste type (Winchester High Street Businesses)**

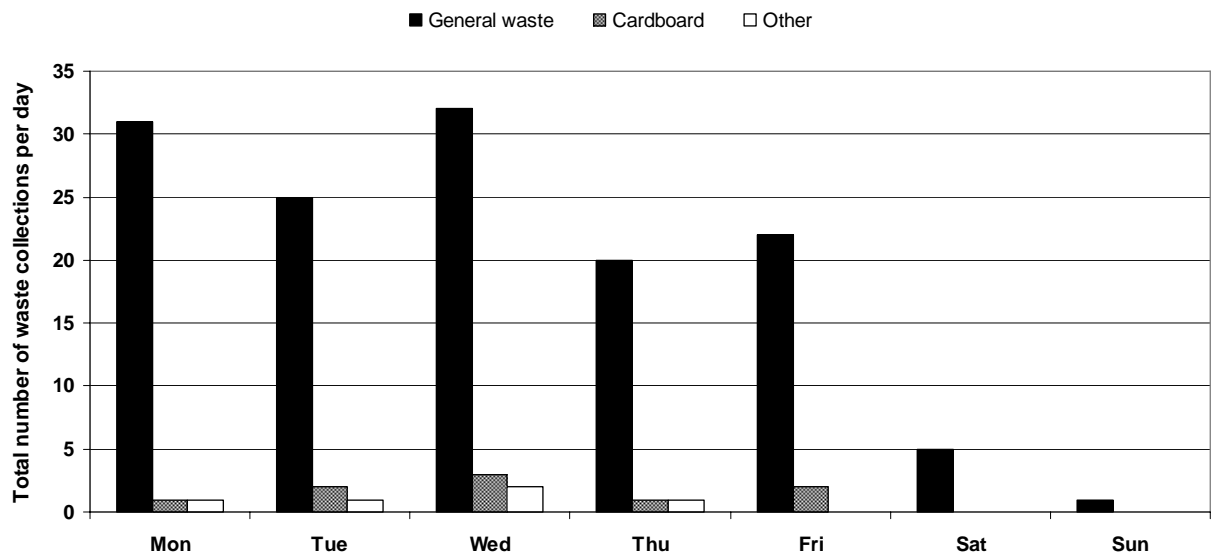
<b>Business Categories</b>	<b>Mean No. collections per week</b>	<b>Mean No. Residual waste</b>	<b>Mean No. Cardboard</b>	<b>Mean No. Other</b>
Charity shops	6.3	4.5		1.8
Clothing Retail	2.2	1.8	0.3	
Food/drink	3.6	2.8	0.8	
Footwear	2.3	2	0.3	
Jewellers	1.5	1.5		
Mobile Phones	2.3	2	0.2	
Opticians	1	1		
Other Retail	2	1.8	0.1	
Other Services	1.5	1.5		
Public house/restaurant	3.3	3	0.5	0.3

#### **4.2 Daily waste collections**

Participants were asked to provide a breakdown of the total numbers of waste collections received by day of the week. Despite providing weekly collection totals, not all business managers could provide a detailed breakdown of daily collections. Waste collection can often be a process organised by a retailers head office and as such, a

local store manager may not get involved with day-to-day collection activities which are pre-scheduled.

The majority of collections were made during weekdays (96%) which are typically the main operational periods for waste contractors (Figure 7). The results indicated that the number of waste collections conducted on Mondays and Wednesdays contributed to 47% of the weekly total. The increased collection vehicle activity reported on Mondays could be associated with the volumes of waste generated over the weekend trading period coupled with the lack of available collections during this period. The numbers of daily waste collections were also calculated for each business category (Tables 9 and 10). It should be noted the total number of weekly collections quoted in Table 9 (150) is less than in Table 10 (159) as some businesses could not provide a daily breakdown of collection activity.



**Figure 7:- Number of waste collections from Winchester High Street businesses per day by waste type**

**Table 9:- Total numbers of waste collections generated by Winchester High Street businesses per day by business category**

Business Categories	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Charity shops	5	4	6	4	4			23
Clothing Retail	5	6	6	2	6		1	26
Food/drink	3	2	3	2	3	1		14
Footwear	2	2	1	1	1			7
Jewellers	1	3	1	1				6
Mobile Phones	2	2	1	2	1	1		9
Opticians	1							1
Other Retail	12	7	13	8	7	2		49
Other Services	1	1	3	1				6
Public house/restaurant	1	1	2	2	2	1		9
<b>Total</b>	<b>33</b>	<b>28</b>	<b>36</b>	<b>23</b>	<b>24</b>	<b>5</b>	<b>1</b>	<b>150</b>
<b>% of weekly total</b>	<b>22.0</b>	<b>18.7</b>	<b>24.7</b>	<b>14.7</b>	<b>16.0</b>	<b>3.3</b>	<b>0.7</b>	

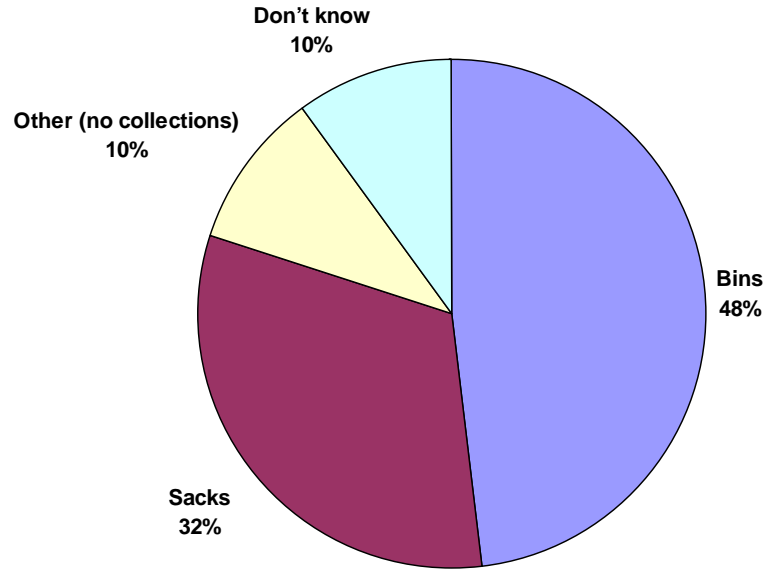
**Table 10:- Proportion (%) of waste collections by business category by day  
(Winchester High Street businesses)**

<b>Business Categories</b>	<b>Mon %</b>	<b>Tue %</b>	<b>Wed %</b>	<b>Thu %</b>	<b>Fri %</b>	<b>Sat %</b>	<b>Sun %</b>
Charity shops	21.7	17.4	26.1	17.4	17.4		
Clothing Retail	19.2	23.1	23.1	7.7	23.1		3.8
Food/drink	21.4	14.3	21.4	14.3	21.4	7.1	
Footwear	28.6	28.6	14.3	14.3	14.3		
Jewellers	16.7	50	16.7	16.7			
Mobile Phones	22.2	22.2	11.1	22.2	11.1	11.1	
Opticians	100						
Other Retail	24.5	14.3	26.5	16.3	14.3	4.1	
Other Services	16.7	16.7	50	16.7			
Public house/restaurant	11.1	11.1	22.2	22.2	22.2	11.1	
<b>Residual waste (%)</b>	<b>22.8</b>	<b>18.4</b>	<b>23.5</b>	<b>14.7</b>	<b>16.2</b>	<b>3.7</b>	<b>0.7</b>
<b>Cardboard (%)</b>	<b>11.1</b>	<b>22.2</b>	<b>33.3</b>	<b>11.1</b>	<b>22.2</b>		
<b>Other (%)</b>	<b>20.0</b>	<b>20.0</b>	<b>40.0</b>	<b>20.0</b>			

### 4.3 Numbers and types of bins

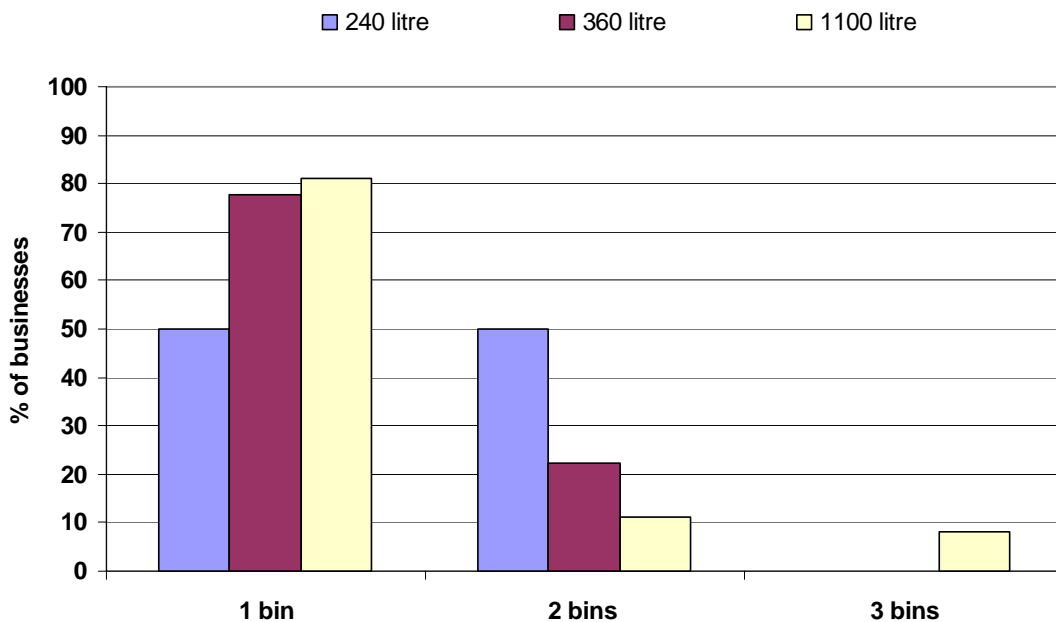
Businesses were asked to provide information on the types and capacity of receptacles (sacks and bins) used to collect waste. A key barrier to more consolidated waste collection practices is often the variety of receptacles used to contain waste, and, as a result, the different collection mechanisms needed on the refuse collection vehicle to handle the receptacles. The results (Figure 8) indicated that 49% of the High Street businesses had residual waste collected from bins with 33% using plastic sacks as part of contractual agreements with the waste collection companies. Businesses often choose to use sacks (where the contractor permits) because space issues on-site make wheeled bins impractical. For the 7 businesses that received regular cardboard collections, 4 used bins and 1 *clothing retailer* stored all flattened cardboard in the stock room and would subsequently load it directly into the collection vehicle.

Businesses back-loading waste did not typically use external bins but used various other receptacles (10%) to ensure that the waste could be transported safely (e.g. bin bags, sacks, totes, cages). During the survey period, the head office of a footwear retailer was in the process of streamlining their company's in-store waste management procedures to increase recycling. Under the new regime, stores would be required to separate out key waste streams into colour coded sacks (e.g. cardboard, plastic) before being back-loaded.



**Figure 8:- Types of receptacles used by Winchester High Street businesses to collect waste**

From the surveys, three different capacity wheeled bins were identified as being used to collect residual waste (Figure 9, 10). The 1100 litre bin, which has the largest capacity, was used by 70% of bin users with only 5% using the smaller 240 litre bins. The majority of businesses (93%) only used one size of bin but 22% used more than one bin.



**Figure 9:- Numbers of different types of bins used by businesses on Winchester High Street**

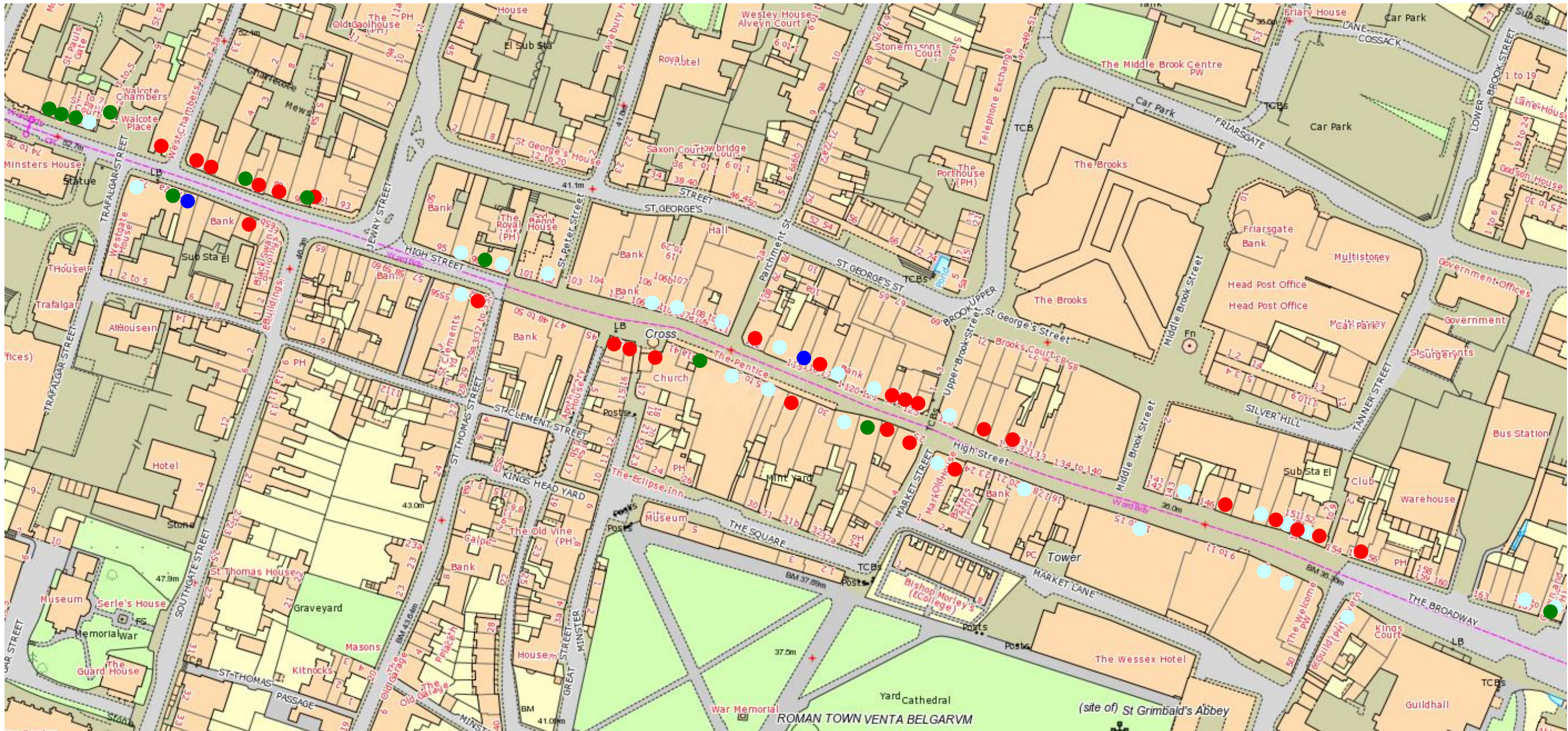


Figure 10:- Types of bins used by Winchester High Street businessse

In the absence of bin weight data, bin capacity has been used as a tool to estimate the potential volumes of waste produced on the High Street. The survey identified that 33% of the sample businesses used sacks.

#### 4.4 Frequency of collections

The frequency with which different capacity bins were emptied per week is summarised in Figure 12. A 3 by 2 homogeneity Chi-Square test highlighted that there were no significant differences between the size of the bin and the frequency with which it was emptied ( $\chi^2 = 3.58$  and  $\chi^2_{(0.05)}(2df) = 5.99$ ). Despite this, Figure 11 highlights that 55% of businesses using 360 litre bins for residual waste had their bins emptied once per week and 33% twice per week whereas businesses with larger 1100 litre bins were more likely to require more frequent collections e.g. more than twice per week. Although sack collections have not been included within this particular analysis, observations made during this survey indicate that sacks are typically collected on the same rounds as bins.

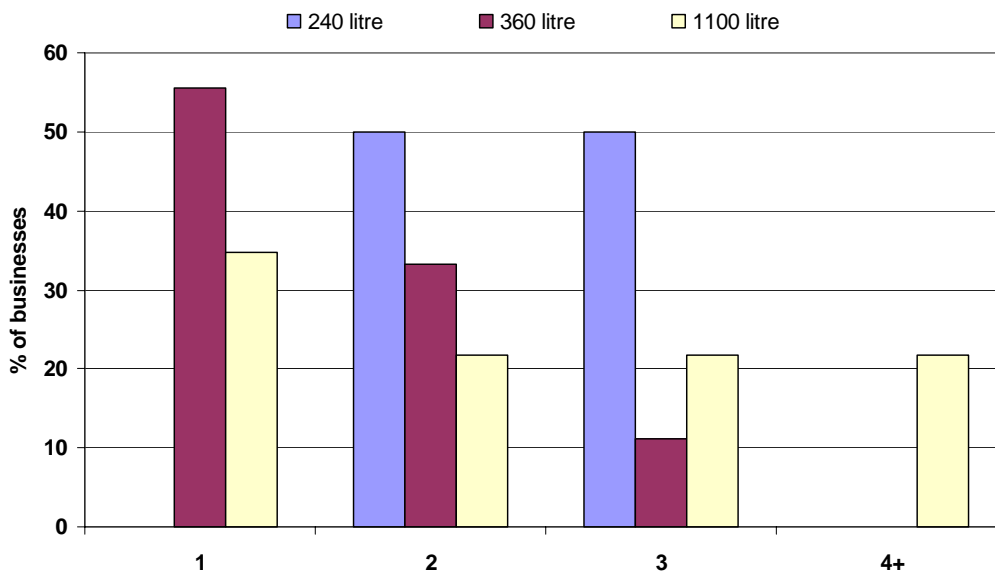


Figure 11:- Bin emptying frequency by bin type (Winchester High Street businesses)

#### 4.5 Waste production (by Litres capacity) of High Street businesses

As the weights of waste produced by the businesses on Winchester High Street has not been collected from the Waste Contractors, an estimate of the potential volume of waste that could be produced by the businesses has been gauged, based on the bin sizes and the number of bins used.

The capacity of residual waste presented for collection by each business category in the High Street were estimated for 27 businesses (estimates could only be derived from businesses using bins as at the time of reporting, the capacity of the sacks had not been established) using daily and weekly collection data in conjunction with bin data (numbers and capacity). Table 11, provides a breakdown of the estimated daily and weekly residual waste capacity by the sampled businesses. For the 27 businesses, on average, 15,203 litres of residual waste bins are presented for collection on a typical day.

**Table 11:- Volumes (Litres) of residual waste collected by business category per day (Winchester High Street businesses)**

<b>Business Categories</b>	<b>Bin &amp; collection data available</b>	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thur</b>	<b>Fri</b>	<b>Sat</b>	<b>Total</b>
Charity shops	1	2200		2200		2200		6600
Clothing Retail	8	1460	2920	1460	1100	2560		9500
Food/drink	1	1100		1100		1100		3300
Jewellers	1		360	360				720
Other Retail	11	14300	8800	14300	8800	11000	4400	61600
Other Services	3	240	360	600	240			1440
Public house/restaurant	2	1100	1100	2560	1100	1100	1100	8060
<b>Total</b>	<b>27</b>	<b>20400</b>	<b>13540</b>	<b>22580</b>	<b>11240</b>	<b>17960</b>	<b>5500</b>	<b>91220</b>

The volumes of residual waste produced per week by each business category (except for mobile phones and banks and building societies) for 107 High Street businesses have been estimated using bin collection data (Table 12). From these projections it was estimated that (assuming sacks/bin capacity needed is the same and each bin is full to capacity) 308,278 litres of residual waste bins might be presented for collection during a typical week. Businesses could reduce the volumes of waste presented and the frequency of collection visits with the use of waste compactors coupled with an increase in cardboard segregation for recycling. It should be noted that the bin collection data available quoted in Table 11 (27) is less than in Table 12 (33) as some businesses could not provide a daily breakdown of collection activity.

**Table 12:- Projected number of bins and volumes of residual waste for 107 High Street businesses**

<b>Business Categories</b>	<b>Total No. of businesses</b>	<b>No. of businesses weekly data available</b>	<b>Recorded volumes of residual waste (litres)</b>	<b>Predicted volumes of waste for non participants (litres)</b>	<b>Total projected volumes (litres)</b>
Charity shops	4	1	6600	19800	26400
Clothing Retail	17	8	9500	10692	20192
Food/drink	9	1	3300	26400	29700
Footwear	4	2	7700	7700	15400
Jewellers	6	1	720	3600	4320
Opticians	5	1	720	2880	3600
Other Retail	34	13	65320	102606	167926
Other Services	14	3	2160	7920	10080
Public house/restaurant	7	3	13140	17520	30660
<b>Total</b>	<b>107</b>	<b>33</b>	<b>109160</b>	<b>194232</b>	<b>308278</b>

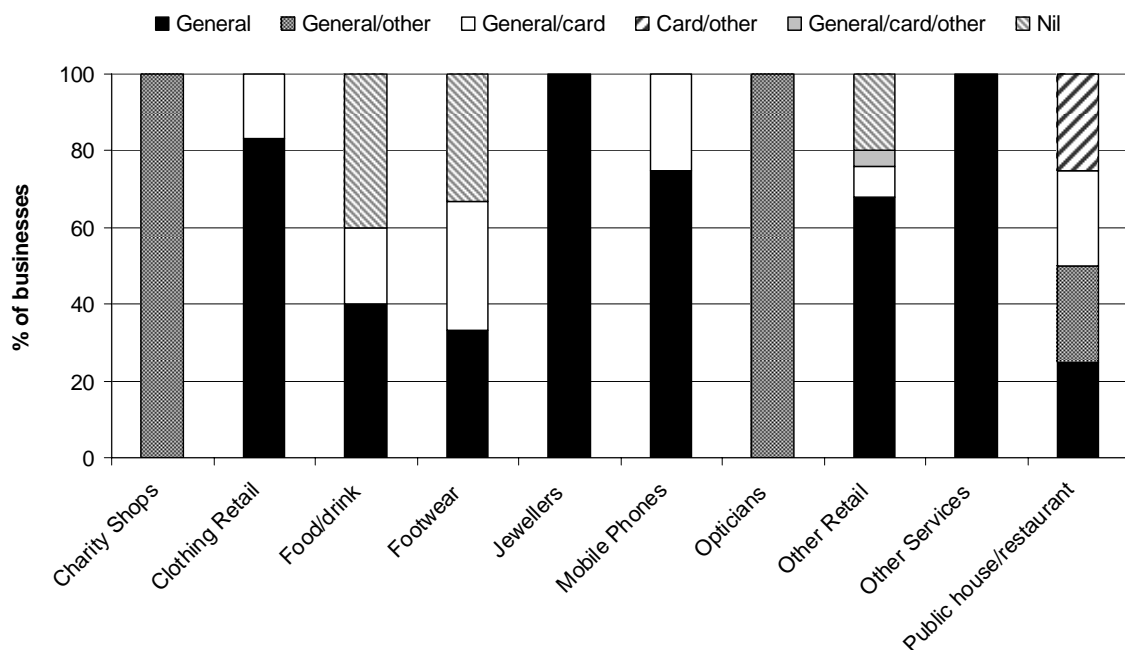
#### **4.6 Number of different waste collections**

The number of different waste collections by the type of material generated (e.g. residual, cardboard) was investigated across each business category. Of the 66 businesses who

supplied data, 64% did not receive any dedicated collections for recycle and disposed of all waste into the same receptacle. From the estimates of waste types produced by these businesses, it is evident that approximately 69% of waste consisted of cardboard and paper which would either be sent to landfill or for energy-from-waste rather than being recycled. With the range of waste collection services provided by contractors collecting residual waste (e.g. Biffa, Sita, Veolia etc) it is unclear why these businesses are not currently segregating these waste streams (general barriers to recycling are discussed in Section 4.11).

Serco, who serviced approximately 53% of these businesses are believed to be the only contractor that do not offer a dedicated cardboard collection service. However as all waste collected by Serco is sent to an energy-from-waste plant (Section 5.2.3) which fulfills the Producer Pre-treatment Requirements, businesses are not required to separate out recycle from the residual waste stream. Currently on Winchester High Street, only 23% of businesses actively separated out key waste streams and subsequently received two or more dedicated collections (residual waste/cardboard, residual/other, cardboard/other or residual/cardboard/other).

Figure 12 summarises the different waste collections reported within each business category. *Other services* and *jewellers* were the only business categories that received only 1 type of collection per week which was for residual waste. However, as data were only available for 1 of the *jewellers*, it is not deemed to be representative of the whole category. All *charity shops* received collections for both residual waste and also textiles which has been grouped into “other collections”.



**Figure 12:- Different waste collections by business category (Winchester High Street businesses).**

#### 4.7 Waste contractors operating on the High Street

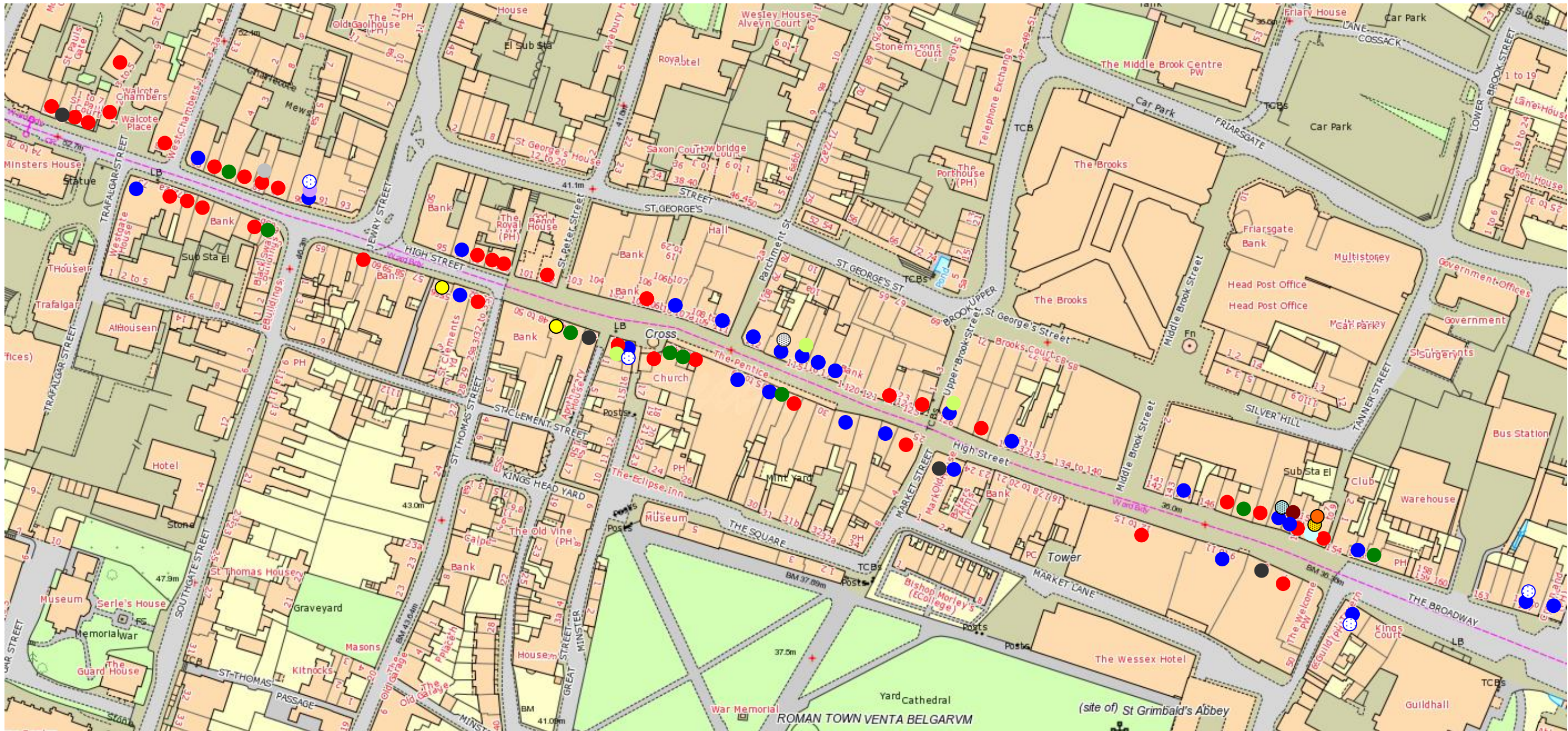
The survey identified that over 14 contractors collected waste and recycle from 74 businesses on Winchester High Street (Table 13 and Figure 13) of which 6 collected residual waste. For the majority of businesses, residual waste was collected either by Serco (47%) or Biffa (38%).

All of the contractors collecting residual waste and cardboard (except Dove Recycling) are identified as being national waste management companies which provide a wide range of commercial services including the collection and management of residual waste, recyclate (cardboard, paper, plastic, and glass), chemicals, and hazardous waste. In this respect each business has the capacity to collect and manage the majority of waste types emanating from the High Street. However, the results from the survey indicate that in reality, businesses frequently choose different contractors to collect different waste types as they look for the most competitively priced contract that meets all their requirements.

**Table 13:- Contractors collecting waste from businesses in Winchester High Street (data supplied by 74 business managers)**

<b>Waste type</b>	<b>Company Name</b>	<b>No. of contracts with High Street businesses in the sample</b>
<b>Residual Waste</b>	Serco	35
	Biffa	28
	Veolia	5
	Greenstar	3
	Sita	2
	Southern Waste Services	1
<b>Cardboard</b>	Biffa	5
	Dove	3
	Sita	1
	Southern Waste Services	1
	Veolia	1
<b>Textiles</b>	RTS Textiles	1
	Rag Collection Ltd	1
	Townsend Textiles International Ltd	1
<b>Oil</b>	AB Oil	1
<b>Batteries</b>	Integra	1
<b>Books</b>	World of Books	1
<b>Chemicals</b>	Remondis	1
<b>Sanitary</b>	PHS	1

Of the businesses that received dedicated cardboard collections, approximately 45% had arrangements with Biffa to take both waste types whereas the remainder outsourced the collections to a different contractor. The reasons why businesses employed more than 1 contractor to handle their waste was investigated but unfortunately, with contractual decisions often being made at head office level, local managers were often not in a position to discuss the reasoning behind waste management practice impacting on the local store. Table 14 details the different residual waste and cardboard contractors used by each business category on the High Street. It is evident that *jewellers* are the only category in which all waste was collected by 1 contractor.



- Residual Waste: ● (blue) ● (red) ● (yellow) ● (black) ● (cyan)
- Cardboard: ● (light blue) ● (light green) ● (yellow) ● (grey) ● (dark grey)
- Textiles/rag: ● (dark red) ● (grey)    Chemical: ● (orange)    Oil: ● (purple)
- No collections: ● (green)

Figure 13:- Distribution of waste contractors/jobbers servicing Winchester High Street businesses

**Table 14:- Residual waste and cardboard collections by business category by contractor (Winchester High Street businesses sample)**

Business Category	Serco	Biffa	Veolia	Sita	SWS	Greenstar	Dove Recycling
Charity shops	3	1					1*
Clothing Retail	6	4	4			1	
Food/drink	2	2/1*					
Footwear	1	1	1*				
Jewellers	6						
Mobile Phones	3	3/1*					1*
Opticians	2	1					
Other Retail	6	12/1*		2/1*	1/1*	2	1*
Other Services	6	1					
Public house/restaurant		3/1*	1				
<b>Total</b>	<b>35</b>	<b>32</b>	<b>6</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>

\*denotes cardboard collections

The numbers of different residual waste collections completed by each contractor per day were calculated for a sample of 54 businesses (who provided all data e.g. name of contractor and collection day/s) and are summarised in Table 15 and Figure 14.

**Table 15:- Numbers of residual waste collections by contractor by day for the Winchester High Street sample**

Business Categories	No. businesses	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Biffa	20	13	5	16	5	10	2	0
LA/Serco	26	14	14	13	10	8	1	1
Veolia	4	2	3	1	3	1	1	
Greenstar	3	2	2	2	1	3	1	0
Sita	1		1		1			
<b>Total</b>	<b>54</b>	<b>31</b>	<b>25</b>	<b>32</b>	<b>20</b>	<b>22</b>	<b>5</b>	<b>1</b>

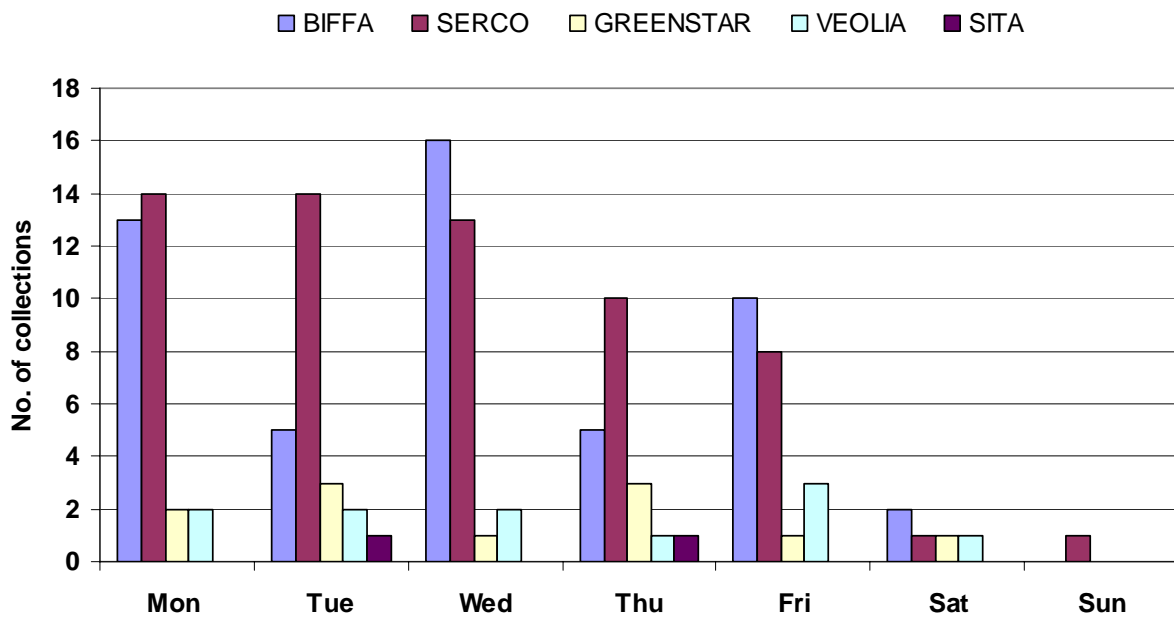


Figure 14:- Number of residual waste collections by contractor by day

A review of the receptacles issued by waste contractors highlighted that a wide range of bin sizes were used on the High Street (Figure 15). Biffa and Serco were identified as the only contractors supplying sacks in addition to bins. For those businesses where space is an issue, employing a contractor who can provide and collect sacks will be a determining factor. Biffa typically issued more bins (69%) with their contracts compared to Serco (44%) who had more contracts collecting sacks.

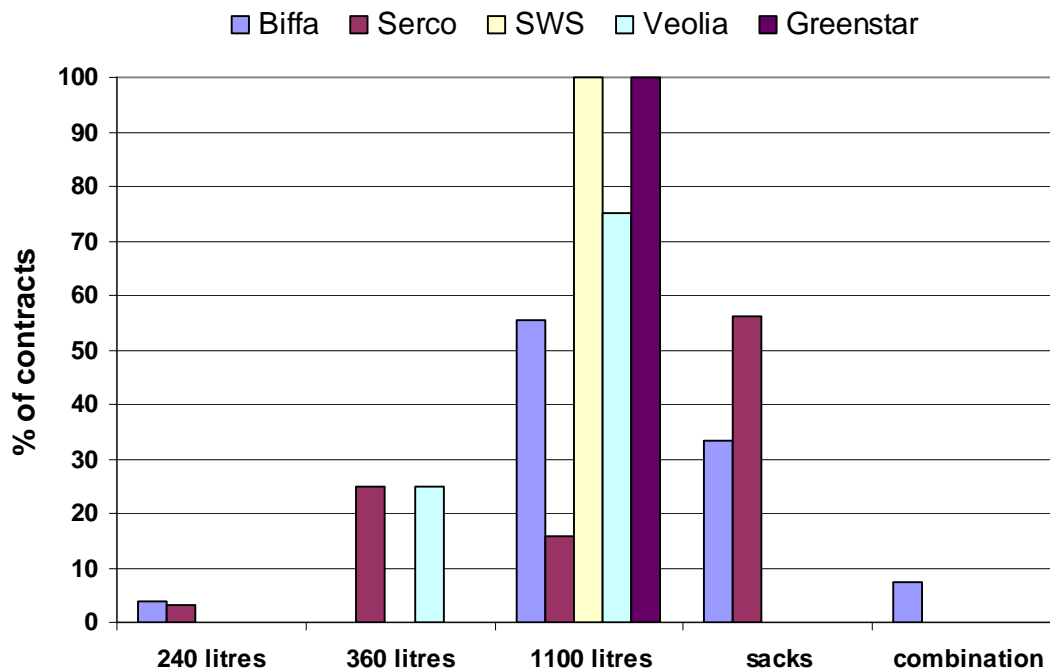


Figure 15:- Types of receptacles issued by waste contractor (Winchester High Street businesses)

#### **4.7.1 Collection times**

Analysis of the stated collection times from the completed questionnaires indicated that 76% of residual waste collections were conducted during the morning before 12:00. The remaining 24% of businesses could not specifically state when collections were made. The lack of accurate timings for collections was also observed for cardboard and other specialised waste types. In order to quantify the peak flows of collection vehicles on the High Street, additional interviews with main waste contractors will be required. Section 5 investigates collection times and round structures in more detail.

#### **4.8 Collection charges**

Businesses were asked to describe how they were charged for waste to be collected e.g. per lift, per collection, by weight or by volume. Very little information was obtained about collection charges as 34% stated that their Head Office dealt with all contractual arrangements and a further 42% simply didn't know. From the few responses that were obtained, it is apparent that payment systems are broadly similar irrespective of whether collections are from bins or sacks. For bins, a standard charge is levied per bin collection according to the size and capacity of the bin e.g. the collection of waste from 1100 litre bin would cost more than from a 240 litre bin. There is therefore an incentive for the retailer to maximize the capacity available and fill the bin to its maximum. For businesses using sacks, collection charges are incorporated in with the overall cost of the sack.

#### **4.9 Vehicle type**

Although businesses were not asked to classify the types of vehicle used to collect waste and recycle, observations have indicated that 26 tonne refuse collection vehicles (RCVs) are typically used to collect residual waste on the High Street. As the RCVs used on the High Street are single bodied vehicles they do not currently have the capacity to collect more than one waste type simultaneously which is why businesses typically receive separate collections for different waste types.

The types of collection vehicles and their specifications will be discussed in more detail in Section 5.

#### **4.10 Projected number of collections for the whole High Street**

For the completed questionnaires, the mean numbers of collections and volumes of waste collected were identified for each business category and were subsequently applied to non-participants to derive an estimate for the whole High Street.

The mean numbers of weekly waste collections discussed in Section 4.1 were used to project the total numbers of weekly collections (residual waste and total collections) for the High Street. Banks and building societies were not included within the projections as they were not interviewed as part of the questionnaire. As the majority of businesses surveyed received collections of residual waste, it was considered appropriate to estimate the total weekly collections for the whole High Street. For the dedicated residual waste collections, it was estimated that the 43 businesses that did not participate in the surveys or provide adequate data on weekly collections could potentially generate an additional 75 collections per week based on the mean waste outgoing of the business categories. Therefore, the total number of residual waste collections generated by the whole High Street (excluding financial institutions) could be in excess of 208 per week (Table 16). It should be noted that through

the additional contractor surveys, inconsistencies have been identified in some of the data obtained from the business surveys, in particular relating to the sizes of bins. Despite this, the data provided by the business managers has been used within all calculations.

The calculations and projections discussed in this section provide an insight into the number of collections generated by businesses on the High Street. However, in order to assess how these collections contribute to overall freight/vehicle movement within the City, the details of each individual collection round would need to be assessed and the numbers of RCVs used to undertake the work.

**Table 16:- Reported, projected and total number of residual waste collections by business category**

<b>Business Categories</b>	<b>Total No. of businesses</b>	<b>No. of businesses (weekly data available)</b>	<b>No. of weekly recorded collections</b>	<b>No. of predicted weekly collections for non participants</b>	<b>Total projected weekly collections</b>
Charity shops	4	4	18	0.0	18.0
Clothing Retail	17	12	22	9.0	31.0
Food/drink	9	5	14	11.2	25.2
Footwear	4	3	6	2.0	8.0
Jewellers	6	4	6	3.0	9.0
Mobile Phones	7	4	8	6.0	14.0
Opticians	5	1	1	4.0	5.0
Other Retail	34	25	45	16.2	60.7
Other Services	14	4	6	15.0	20.0
Public house/restaurant	7	4	9	9.0	18.0
<b>Total</b>	<b>107</b>	<b>66</b>	<b>135</b>	<b>75.4</b>	<b>208.9</b>

#### **4.11 Barriers to improved recycling performance**

The survey of business managers highlighted that at present, recycle is diverted from the residual waste stream either by being collected separately by waste contractors or by being back loaded in delivery vehicles. Section 2 has highlighted that a significant proportion of the total waste output has a secondary value and can be directly recycled.

Businesses were provided with an opportunity to describe what they considered to be the main factors impacting on their current recycling performance. Participants were shown a list of potential factors and asked to select those which they felt were applicable:-

- Lack of separation/storage space inside and outside
- Lack of awareness
- Cost of extra collections
- No suitable collections
- Limited quantity of recycle
- Lack of manpower/time

A summary of responses are shown in Figure 16 which highlights that 53% of businesses stated that they were happy with their current recycling performance. For the remaining 47%

of businesses, cost of extra collections (36%) and lack of separation and storage space inside and outside the premises (33%) were identified as the main factors impeding recycling performance. Of all the business categories represented on the High Street, Charity Shops are more unlikely to employ additional contractors to improve their recycling performance. Increased operational costs associated with waste management would directly reduce the funds available for the designated charity. As these business sell second hand goods which are donated by the public, back-loading of recycle with delivery vehicles is not an option.

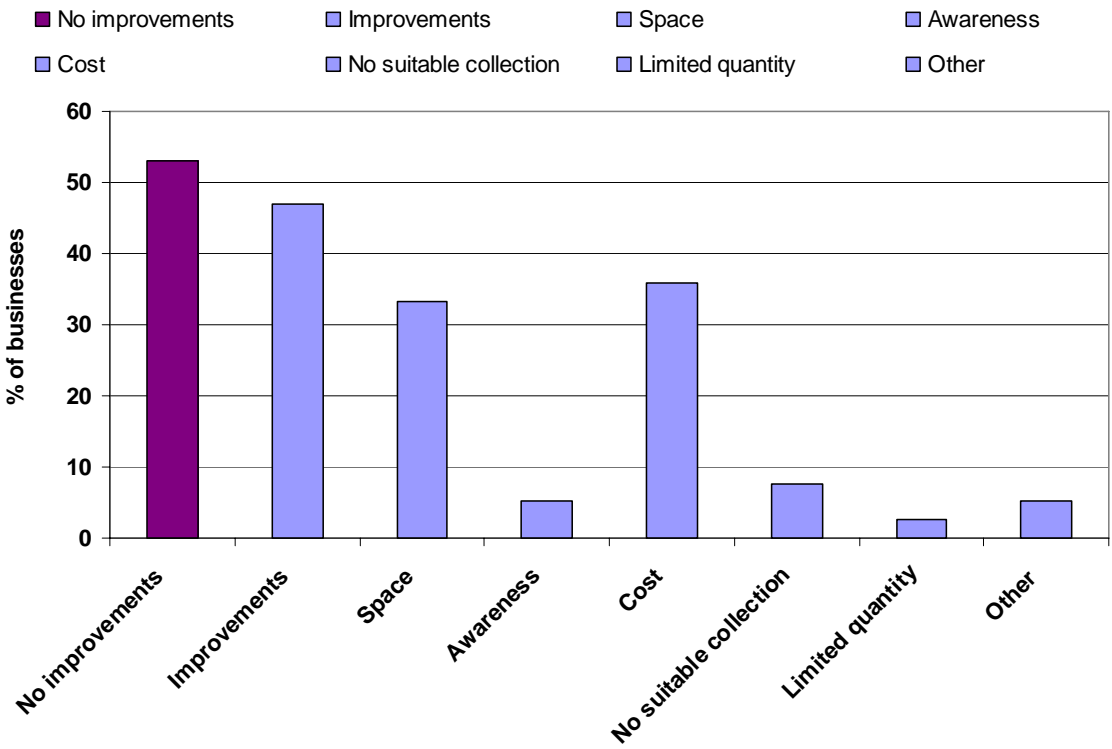


Figure 16:- Factors limiting current recycling performance

## **5 Collection systems used by waste contractors**

Details of the collection systems (the treatment and disposal facilities used, route schedules and fleet characteristics) used by the 4 waste contractors (referred to as Contractor A, B, C and D) responsible for over 90% of residual waste collections on the High Street were explored through interview surveys. A summary of the collection systems, collection rounds and methods used to dispose of residual waste and process recyclate are discussed in this section for each contractor.

### **5.1 Contractor A**

#### **5.1.1 Collection service**

Contractor A, a national waste contractor, operated 3 commercial rounds collecting residual waste (Monday to Saturday, inclusive), and cardboard (Thursday) from businesses on Winchester High Street. Typically, collections from issued sacks (90 litres) and bins (240, 360, 770 and 1100 litre) were made using single bodied, 26 tonne refuse collection vehicles (RCVs) with a maximum payload of 12 tonnes (residual waste). Contractor A did sub-contract some work to Contractor B primarily because they can access the High Street earlier as their vehicle depot is located in the city.

In addition to the scheduled collections, additional collections were available to existing contracted customers 'on request' which would simply be added on to the existing round. The business manager's survey suggested that storage space restrictions in Winchester forced many retailers to require more frequent collections than they would have required in other towns.

#### **5.1.2 Collection rounds**

Individually, contractors did not have enough business on the High Street to generate a complete day's work and therefore rounds were configured to incorporate other trade collections in neighbouring locations in and around Winchester. Due to fluctuations in the number of customers requiring 'on-request' collections, the structures of the rounds had to be frequently updated and reconfigured. For Contractor A, the collection routes and rounds were configured using in-house knowledge and experience of the area rather than routing and scheduling software.

Each of the 3 rounds servicing the High Street started and finished at the contractors vehicle depot located in Marchwood (Southampton), 30 kilometres from Winchester High Street. The empty RCVs typically left the depot at 05:00 and headed towards the High Street ensuring that this part of the round was completed before the on-set of the rush hour. As the High Street is also a residential area, if collections are conducted during the night or too early in the morning before 06:00, there is a risk that the council may receive complaints on the grounds of statutory noise/nuisance (Environmental Protection Act 1990, Section 80). As Winchester City Council do not undertake collections during these times they can use this as an effective argument and reason for other waste operators not to collect during these times.

After collecting residual waste from the High Street, the contractor continued with the round which included servicing commercial premises in Stockbridge and Andover. Depending on the quantities of waste collected, the RCV sometimes had to tip on route.

### 5.1.3 Residual waste disposal

Residual waste collected by Contractor A was tipped at a number of different destinations including Squab Wood landfill site in Romsey 29 kilometers from Winchester, Lift and Shift transfer station in Southampton 23 kilometers from Winchester and also locations in Andover. The circumstances dictating site selection are currently being investigated with the waste contractor. Vehicles are tipped at the end of the round on route to the depot although additional tipping may be required during peak periods. The distance travelled on a typical collection round was estimated using round information provided by the waste contractor (e.g. key locations where collections were made) using Microsoft MapPoint 2004. It was estimated that over 638 kilometres (106 kilometres/per day, Monday to Saturday, inclusive) are travelled by the 6 RCVs collecting residual waste from Winchester High Street each week (Figure 17). It should be reiterated that the round distances quoted within this Section of the report are estimates which were calculated from limited information. In order to obtain a more accurate calculation a detailed breakdown would be required containing the postal addresses for every collection made each day. It is also suggested that the total distance travelled could significantly be increased if additional tipping was required depending on the proximity of the tip to the collections.

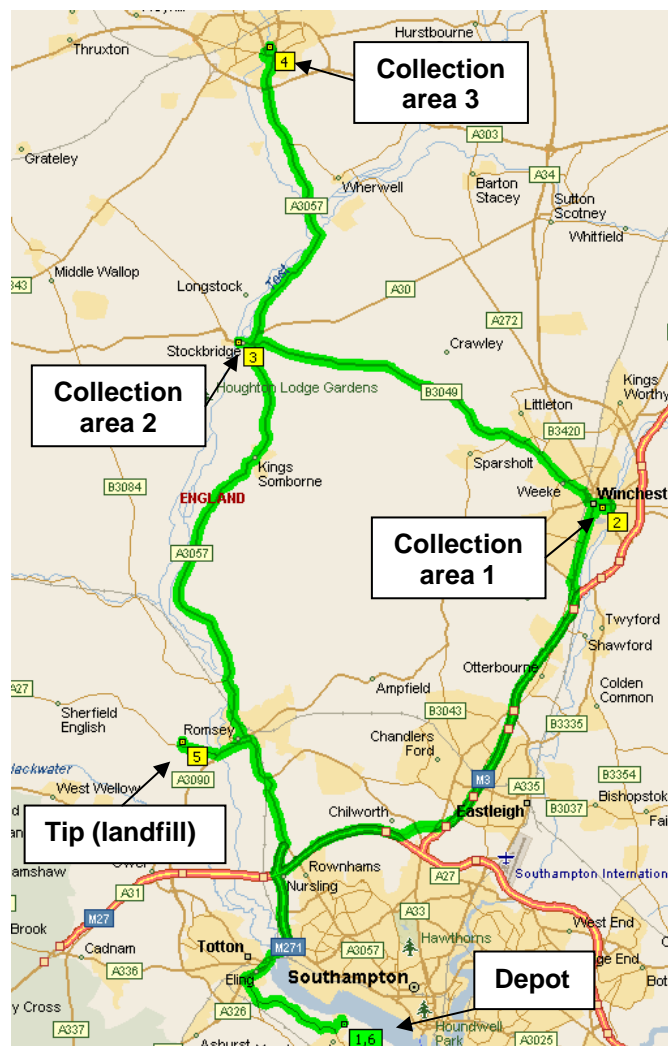


Figure 17: Summary of a residual waste collection round for Contractor A serving businesses on Winchester High Street

#### **5.1.4 Processing of recyclate**

Two separate vehicles were sent each week to collect cardboard and glass (primarily from public houses) from Winchester High Street although the details of these rounds were not made available. All cardboard collected was tipped at a cardboard/paper recyclers depot in Southampton (30 kilometres from Winchester) where it was baled, bulked and transported 181 kilometers to a paper mill at Townsend Hook, Kent. Typically, 7 articulated vehicle loads of cardboard were transported from Southampton to Kent each week. Once processed, the material was sold to the corrugated division of the company for reprocessing into boxes.

### **5.2 Contractor B**

#### **5.2.1 Collection service**

Contractor B, a national waste contractor provided a residual waste collection service for businesses in Winchester. Collections were made from the High Street between Monday and Friday with a limited service available on Saturday for those customers who already received daily collections. A single bodied short wheel base RCV with a maximum payload of 9 tonnes was used to collect residual waste from sacks (90 litres) and bins (240, 360, 770 and 1100 litre). This reduced capacity vehicle was used due to its manoeuvrability around the narrow streets of Winchester, although the reduced payload capacity increased the frequency of tipping. Although Contractor B did not provide a commercial recycling service, businesses were asked to place all cardboard next to the residual waste bin rather than inside in order to maximise the capacity of the bin. To ensure that the cardboard was collected with the residual waste a pre-paid sack had to be attached to it. In addition to the scheduled collections, additional collections were available 'on request' which could easily account for both expected and sudden increases in waste production.

#### **5.2.2 Collection rounds**

The residual waste collection round started at the vehicle depot in Bar End Winchester, 1.3 kilometres from the High Street. The empty RCV left the depot just before 06:00 which was slightly later than the other contractors surveyed due to its proximity to the collection round.

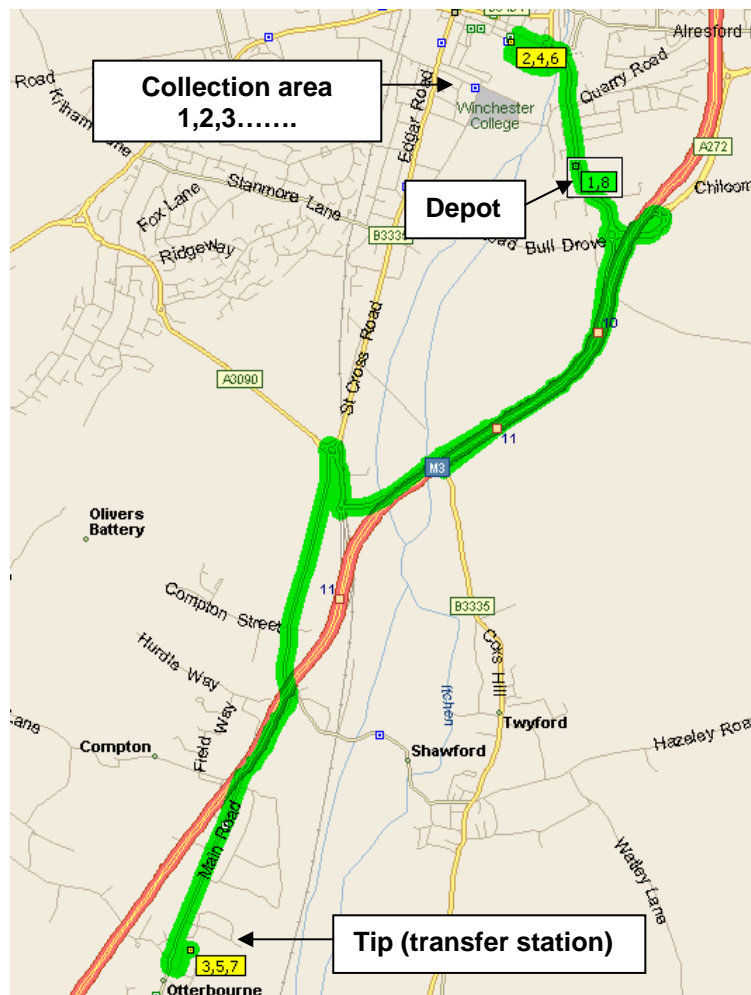
Out of the contractors surveyed, Contractor B operated perhaps the most complex collection round in which collections from the High Street and surrounding areas were completed in up to 3 circuits relying on the vast experience of the driver to decide in which order the scheduled collections were to be made. This was primarily due to the number of customers using sacks who did not set them out until the morning of collection, which, in some instances would be after 09:00. As the RCV typically completed the first circuit of collections before 07:00, these retailers would be missed if the vehicle did not return. Theoretically, all collections from the High Street could be made after 09:00, however this is not practical due to access restrictions and parked cars impeding bin access.

#### **5.2.3 Residual waste disposal**

Due to the reduced capacity of the RCV in comparison to other contractors, Contractor B tipped up to 3 times during the round at the Pole Lane Transfer Station in Otterbourne, 8 kilometres from the High Street. Here it was stored, bulked and transported 31 kilometres by a separate contractor to an energy-from-waste facility in Marchwood, Southampton where all waste (including recyclate) was incinerated.

It was estimated that that over 444 kilometres (74 kilometres/per day, Monday, to Saturday, inclusive) could be travelled by the 6 RCVs collecting residual waste from Winchester High Street each week. However, due to the variable nature of the collection requirements, this may be an underestimate of the distances travelled on average per round. Figure 18, contains a simplified summary of the residual waste collection round incorporating businesses on Winchester High Street although it is suspected that the collection vehicle does actually service a wider area than shown.

It is suggested that the incineration of waste at an energy-from-waste facility could be the easiest and most cost effective way for businesses to meet the pre-treatment requirements and possibly the least transport intensive disposal option. Despite the relative effectiveness of this disposal option, it is unclear why other contractors operating on the High Street did not use this facility. It is predicted that the revenue generated from recycle, irrespective of the current economic climate, would have been a determining factor resulting in contractors providing separate residual and recycle collections.



**Figure 18:- Simplified summary of a residual waste collection round for Contractor C serving businesses on Winchester High Street**

## **5.3 Contractor C**

### **5.3.1 Collection service**

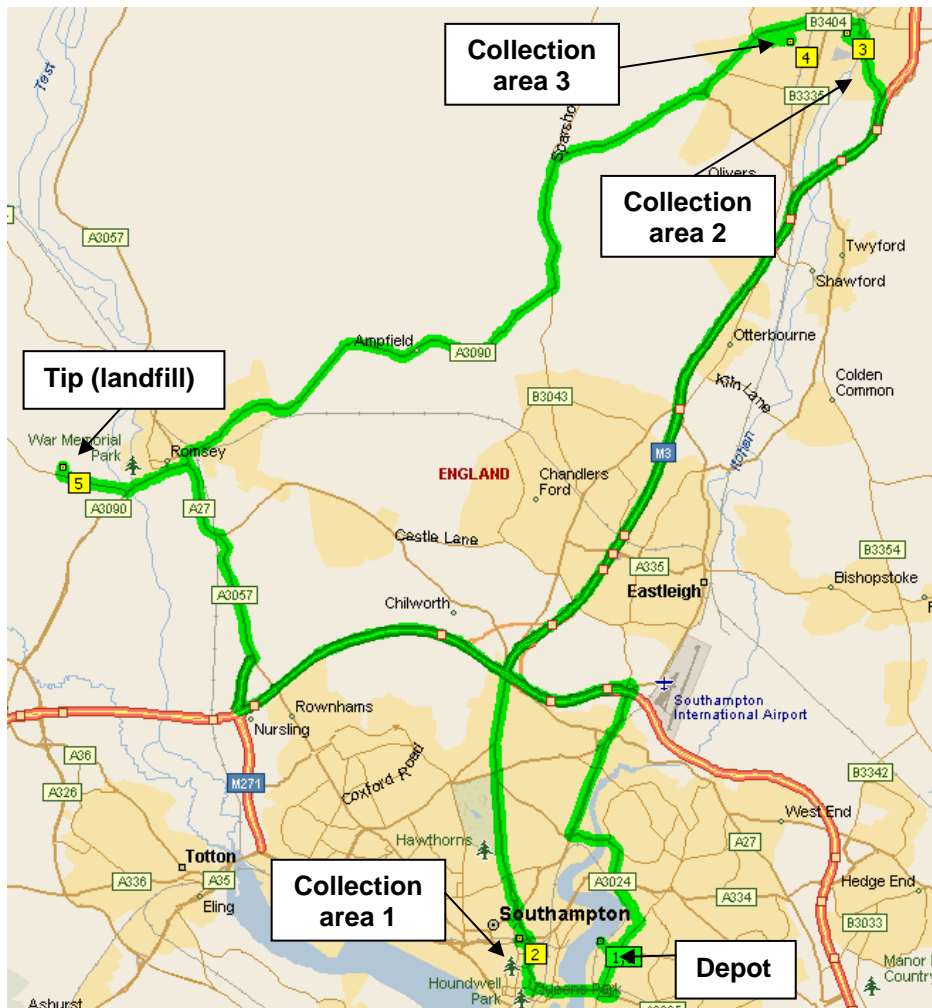
Contractor C, a national waste contractor, operated 2 commercial rounds collecting residual waste (Monday, Thursday and Saturday, inclusive), and commingled recyclate (Tuesday) from businesses on Winchester High Street. A fleet of 3 different RCVs with maximum payload capacities of 4.5 (4 wheeler), 6 (6 wheeler) and 8 (8 wheeler) tonnes were used to collect waste and recyclate from issued sacks (90 litres) and bins (240, 660 and 1100 litre). In addition to the scheduled collections, additional collections were available 'on request' which would simply be added on to the existing round. Contractor C also provided additional services to customers requiring collections on days where vehicles were not operating on the High Street (Tuesday, Wednesday, Friday).

### **5.3.2 Collection rounds**

The 2 rounds servicing the High Street started and finished at the contractors vehicle depot in Woolston (Southampton), 23 kilometres from Winchester High Street. The empty RCVs typically left the depot at 05:30 to collect waste from Solent University, Southampton before heading towards Winchester High Street and Winchester University. Typically for residual waste, the vehicle would be tipped on route back to the depot in Woolston at the end of the round. Collections were offered to businesses on Winchester High Street primarily due to the existing contract with Winchester University which required Contractor C to make regular collections from the city (Figure 19). Collection routes and rounds were primarily configured using in-house knowledge and experience of the area although Microsoft Autoroute has been used. On average, Contractor C completed between 90-120 lifts per round from 40-50 businesses.

### **5.3.3 Residual waste Disposal**

Residual waste collected by Contractor C was tipped at Squab Wood landfill site, Romsey, 29 kilometers from Winchester. It was estimated that over 213 kilometres (71 kilometres/per day, Monday, Thursday and Saturday, inclusive) are travelled by the 3 RCVs collecting residual waste from Winchester High Street each week.



**Figure 19: Summary of a residual waste collection round for Contractor C serving businesses on Winchester High Street**

### 5.3.4 Processing of recyclate

Since completion of the surveys Contractor C has introduced a weekly commercial co-mingled recycling collection service where all recyclate is collected in one receptacle for each business. A vehicle is sent each week to collect commingled recyclate from Winchester High Street although the details of these rounds were not made available. All commingled recyclate is transported to a transfer station in Portsmouth where it is bulked with material collected on other rounds and transported 323 kilometres to Contractor C's MRF in Aldridge, Birmingham. Articulated bulker trailers make this trip between 2 and 3 times per week transporting 20 tonnes of recyclate typically per load.

The initial destination of this recyclate stream may change in the future as Contractor C is currently developing a "super MRF" in Edmonton, London (194 kilometers from Portsmouth) and during the Summer 2009, a new MRF will be opening in Marchwood, Southampton, 48 kilometres from Portsmouth. The use of both of these sites would reduce the vehicle miles travelled associated with re-processing recyclate.

On arrival at the Aldridge MRF, the recyclate is sorted (mechanically and physically) and separated into 10 different material streams which include newspaper, cardboard, soft mix, commingled, aluminium, steel, HDPE plastic, PET plastic, mixed plastic and glass. Once separated, the recyclate will be prepared and subsequently collected by 18 different waste

companies for onward transportation to 20 different locations within the UK and France (Saint Marie La Blache) for re-processing or manufacturing (Table 17). There are some cases where cardboard, soft mix paper, aluminium, steel (all), and PET plastic are initially transported to destinations within the UK but then exported to China or India for re-processing. The details of these transactions have not been investigated at this point in time.

**Table 17: Destinations of material streams separated at Aldridge MRF**

<b>Material</b>	<b>Destination 1</b>	<b>Distance (km)</b>	<b>Destination 2</b>
<b>Newspaper/pamphlets</b>	Aylesford	269	
<b>Cardboard</b>	Caerphilly	197	China China/India
	Didsbury	123	
	Coalville	66	
<b>Soft mix paper</b>	Caerphilly	197	China China/India
	Manchester	123	
	Coalville	66	
<b>Commingled</b>	Darwen	170	
<b>Aluminium</b>	Enderby	79	India
	Congleton	91	
	Warrington	119	
<b>Steel</b>	Doncaster	167	India India India
	Enderby	79	
	Spalding	164	
<b>HDPE (plastic)</b>	Redcar	325	
<b>PET (plastic)</b>	Saint Marie La Blache, France	958	China
	Dagenham	222	
	Wallsend	371	
	Biggleswade	163	
<b>Mixed Plastic</b>	Preston	167	
	Egleton	119	
<b>Glass</b>	Nether Kellett	208	
	Syston	94	
	South Kirby	178	

## 5.4 Contractor D

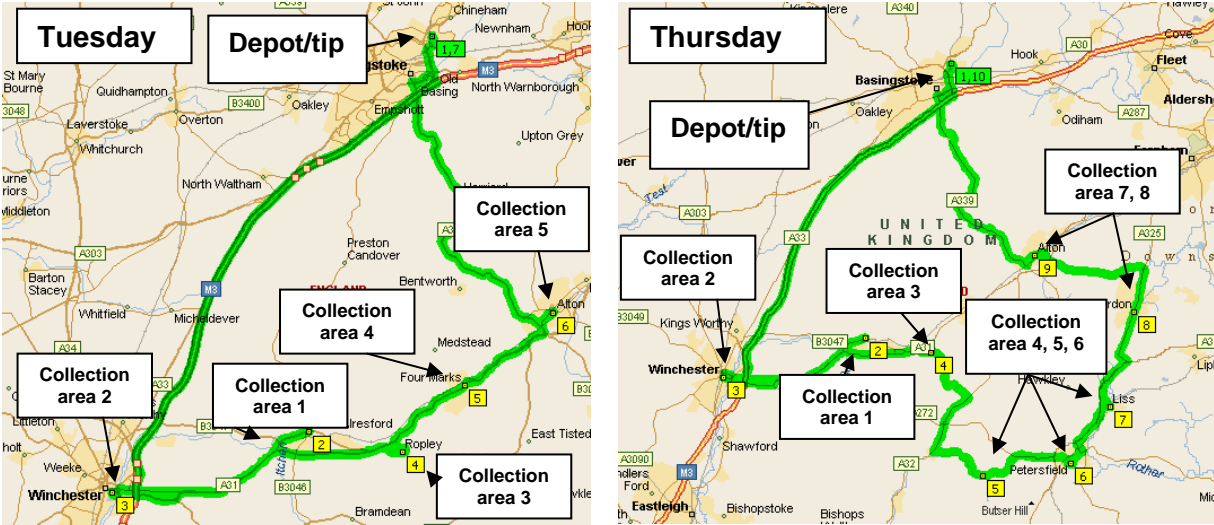
### 5.4.1 Collection service

Contractor D, a family run waste contractor operating from Basingstoke, operated 2 commercial rounds collecting residual waste (Tuesday and Thursday inclusive), and cardboard (Thursday) from businesses on Winchester High Street. RCVs with maximum payload capacities of 13 tonnes were used to collect waste and recycle from issued sacks (90 litre) and bins (240, 360, 660 and 1100 litre). As Contractor D was only in Winchester 2 days each week, no additional services were available to customers requiring additional collections on days where vehicles were not in the vicinity.

**5.4.2 Collection rounds**

The 2 rounds (residual and cardboard) servicing the High Street started and finished at the vehicle depot in Basingstoke, 33 kilometres from Winchester. Collection routes and rounds were primarily configured using in-house knowledge and experience of the area. Although both of the Tuesday and Thursday rounds serviced Winchester High Street, there was a slight variation in the other locations visited by the RCV as highlighted in Figure 20.

The empty RCVs typically left the depot at 06:00 to collect waste from Alresford, before heading towards Winchester. Typically the vehicle would be tipped back at the vehicle depot in Basingstoke. On average, Contractor D completed between 100-150 collections per round of which it was estimated that 12 were from businesses on Winchester High Street.



**Figure 20: Summary of a residual waste collection round for Contractor D serving businesses on Winchester High Street**

**5.4.3 Residual waste disposal**

Unlike the other 3 contractors, Contractor D had a wide range of on-site facilities at their depot to support their operation which included a transfer station, weighbridge and also a sorting area for the recovery of recyclate. All residual waste collected by Contractor D was tipped at the vehicle depot where it was processed to recover recyclate (cardboard, paper, plastic and metals). All non-recoverable waste was subsequently bulked and transported 88 kilometres to a landfill site in Swindon, Wiltshire. Although the Chineham energy-from-waste plant was located just over 3 kilometers away, this facility was not a viable option as it was only permitted to process municipal rather than commercial waste. Irrespective of this legislative barrier, the Swindon Landfill site was primarily chosen as it enabled the contractor to collect wood on the return leg which was chipped back at the Basingstoke Depot and used as fuel for a power station in Essex.

It was estimated that that over 257 kilometres (107 kilometres/Tuesday, 150 kilometres/Thursday) were travelled by the 2 RCVs collecting residual waste from Winchester High Street each week.

#### 5.4.4 Processing of recyclate

A vehicle was sent each week to collect cardboard from businesses on Winchester High Street although the details of these rounds were not made available. All collected cardboard was transported back to the vehicle depot where it was re-sorted to reduce the contamination ratio and improve the quality of the material. It was subsequently transported just over 1 kilometre to a specialist material processor although it is unclear whether the material was re-processed at this facility or whether it was transported to other locations within the UK.

#### 5.5 Summary of waste contractors key operating characteristics

The key operating characteristics of the 4 waste contractors collecting waste and recyclate from Winchester High Street are summarised in Table 18. It was estimated that the 4 contractor's sent a total of 17 vehicles each week to collect residual waste from Winchester High Street generating approximately 1552 kilometers in vehicle miles (average 91 kilometers per round). In addition to residual waste collections, 2 contractors (Marchwood and Basingstoke) provided weekly cardboard collections (Tuesday and Thursday). Since completion of the surveys 1 contractor has introduced a weekly commercial co-mingled recycling collection service where all recyclate is collected in one receptacle.

**Table 18: Characteristics of residual waste collection systems used by 4 contractors (\*restricted service)**

	<b>Contractor A</b>	<b>Contractor B</b>	<b>Contractor C</b>	<b>Contractor D</b>
<b>Vehicle depot</b>	Marchwood (Southampton)	Winchester	Woolston (Southampton)	Basingstoke
<b>Distance to Winchester</b>	29.9km	1.3km	23.4km	33km
<b>Residual collections</b>	Mon to Sat	Mon to Sat*	Mon, Thur, Sat*	Tue and Thur
<b>Vehicle type</b>	RCV	Short wheel base RCV	Various size RCV	RCV
<b>Max payload</b>	12 tonnes	9 tonnes	4.5, 6 & 8 tonnes	13 tonnes
<b>Recycling collections</b>	Thursday (cardboard)	No recycling collection	Tuesday (commingled)	Thursday (cardboard)
<b>Total No. vehicles/week</b>	8	6	4	3
<b>Average No. collections per round</b>	N/A	N/A	40-50 (90-120 lifts)	100-150
<b>No. tips/per round</b>	1	3	1	1
<b>Tipping destination</b>	Various Landfill (Hampshire) Transfer stations (Southampton/ other)	Transfer Station (Otterbourne)	Landfill (Hampshire)	Transfer station/ sorting facility (Basingstoke)
<b>Final destination</b>	N/A	Marchwood EfW	N/A	Landfill (Wiltshire)
<b>Distance travelled /per round/per week (km) for residual waste</b>	106/638.4km	~74/444km	71/213km	107 km (Tuesday) 149.6 km (Thursday) 256.9km
<b>Receptacles</b>	Sacks Bins 240, 360, 770, 1100 litre	Sacks Bins 240, 360, 770, 1100 litre	Sacks Bins 240, 660, 1100 litre	Sacks Bins 240, 360, 660, 1100 litre

### **5.5.1 Similarities in operating characteristics of waste contractors**

It is evident from this review that there are some key similarities and differences in how the contractors operate their collection systems:

- Contractors collected waste from a range of receptacles which include both sacks and bins (although the range of bin capacities available does vary slightly between contractor e.g. 660 or 770 litre).
- Contractors do not have enough customers on the High Street to generate a whole collection round and therefore the collection vehicle services businesses in surrounding towns and villages.
- Contractors provided a flexible collection service (scheduled and on-demand collections) for residual waste which easily accounts for both expected and sudden increases in waste production (except Contractor D).
- Contractors used single capacity RCVs which were only able to collect one waste stream at a time.
- Each round started at the contractors vehicle depots which were located between 23 and 33 kilometres from Winchester (except Contractor B whose depot was located in Winchester).
- Collections from the High Street were completed early on in the collection rounds primarily due to the traffic issues in and around the city (except for Contractor B who collected waste in cycles).
- Tipping typically occurred once per day at the end of the round.
- Residual waste was typically disposed of within Hampshire (except Contractor D where it was taken after being sorted to a landfill site in Swindon).
- Due to the economic downturn the fill rate of the vehicles and tipping ratios have been reduced.
- Contractors collecting recyclate (cardboard or commingled) offered a limited service where collections were only made on one day each week.
- Businesses were required to pay per individual collection whether for residual waste or recyclate.

### **5.5.2 Differences in the operating characteristics of waste contractors**

The waste contractor surveys highlighted that the costs of disposal, legal restrictions, contractual obligations (which may require a specific facility to be used e.g. Otterbourne transfer station by the city council's contractor), proximity of facilities, and also the availability of own, in-house disposal facilities were all factors that impacted on the collection systems and disposal options used by each business. As a result, the main differences identified between the operating characteristics were associated with the frequency of collections from Winchester High Street (2 to 6 collections per week) and the capacity of the RCVs used within the collection fleets (4.5 to 13 tonnes)

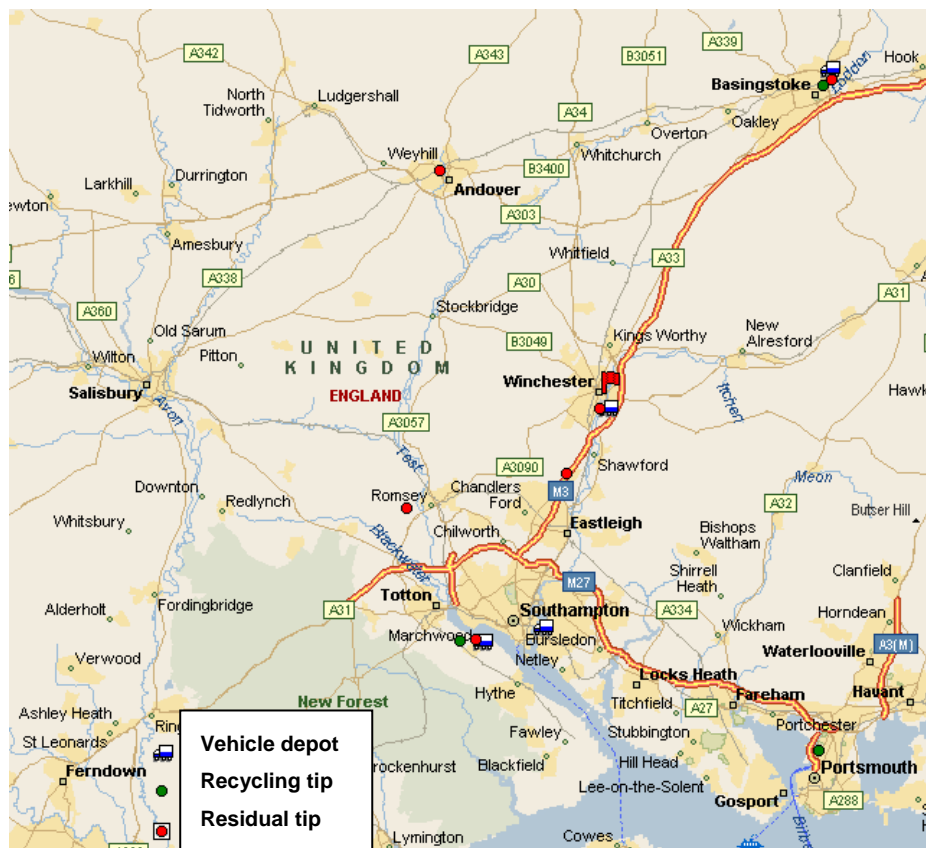
### **5.6 Alternative disposal options**

Through the additional surveys with the 4 waste contractors, the main disposal routes for waste and recyclate have been identified and summarised in Table 19 and Figure 21. In the majority of cases (except disposal options used by Contractor D) the disposal of residual waste is managed within Hampshire an average of 26 kilometres from Winchester. The management of recyclate however is more complicated, essentially due to the lack of reprocessing facilities within Hampshire. Recyclate collected from the High Street is typically collected by a waste contractor, tipped at a transfer station or is taken directly to a recycling depot where it is pooled and transported to a reprocessing plant outside Hampshire.

**Table 19:- Summary of disposal and reprocessing of waste/recyclate collected from Winchester High Street**

Facility	Facility	Types of waste	Distance from Winchester
Landfill sites	Squab Wood, Hampshire	Residual waste	29 km
	Swindon, Wiltshire	Residual waste	66 km
Transfer stations	Poles Lane, Otterbourne	Residual waste	10 km
	Andover, Hampshire	Residual waste	24 km
	Portsmouth, Hampshire	Commingled recyclate	50 km
Transfer stations/sorting	Basingstoke, Hampshire	Residual waste/cardboard	34 km
Energy from waste	Marchwood, Hampshire	Residual waste	30 km
Recycling depots	Marchwood, Hampshire	Cardboard	30 km
	Basingstoke, Hampshire	Cardboard	34 km
Material Recycling Facilities	Aldridge, Midlands	Commingled recyclate	276 km
Reprocessing plant	Townsend Hook, Kent	Cardboard	181 km

(The reprocessing routes from Aldridge MRF, summarised in Table 17 have not been included within this Table)



**Figure 21:- Location of vehicle depots and tipping facilities used by the 4 waste contractors**

The transport chains associated with the collection and transportation of recyclate are subsequently more complex. It is apparent that the Governments measures in the UK to reduce the dependence on waste to landfill and increase recovery performance will inevitably increase transport movement and associated impacts. There is therefore the potential that

the increased focus on material recovery could therefore be in direct conflict with Government policy to tackle climate change and decrease emissions of CO2 to the atmosphere (Maynard and Cherrett, 2006). In order to minimise these impacts contractors should be encouraged to, where logistically feasible use the most optimally located facilities (transfer station, energy from waste plants, landfill sites) to the collection area and vehicle depots. Figure 22, provides some alternative disposal facilities that could be used primarily for residual waste which do not currently appear to be used by the 4 waste contractors surveyed.



**Figure 22:- Alternative disposal facilities within Hampshire, radius of 55 kilometres from Winchester**

**5.7 Economic climate and the impact on waste collections**

Discussions were held with the 4 contractors about the current economic climate within the UK and whether this was impacting on the waste management industry. Each commented that since the economic down turn there had been noticeable changes to their waste collection rounds which included:-

- A reduction in the volumes of trade waste being set out for collection (waste volume can be coupled with retail sales)
- An increase in the number of businesses failing to settle their invoices or delaying payments,
- An increase in the number of businesses cancelling their contracts,

In one instance, reductions in the volumes of waste being set out has enabled the RCV to collect all residual waste requiring only one tip at the end of the round.

## **5.8 Future of waste collections**

This report has discussed the different systems used by retailers on Winchester High Street to manage their waste which included back-loading, dedicated, separate waste collections and disposal at local HWRCs. Cost is a major factor impacting on the type of waste and recycle collection systems used by retailers. Retailers wanting to recycle particular waste streams e.g. cardboard, plastic and glass will need to identify contractors that can provide the most appropriate service in terms of cost and frequency of collection. At present, for those retailers outsourcing collections, each different waste stream that is separated requires a dedicated collection as it is not cost effective for contractors to collect or process commingled recycle. This not only has negative associated transport impacts but makes recycling costly. It is subsequently the cost associated with these separate collections that is a key factor impacting on material recovery.

Since completion of the business surveys in June 2008, co-mingled recycling collections have been introduced by Contractor C and are likely to be introduced by Contractor A during summer 2009. The opening of a new Material Recycling Facility (MRF) in Marchwood, Southampton will provide new opportunities for contractors operating in the area to maximise recovery and expand on the range of services that they are able to provide. As the plant will be able to process mixed dry recyclables (100,000 tonnes in addition to 100,000 tonnes of source separated recovered paper) waste contractors will be in a position to provide their customers with a new recycling service where all dry recycle can be disposed of into one bin. Not only is this system more cost effective for both the contractor and the customer (cheaper than landfill), but it will significantly increase material recovery, provide a more sustainable alternative to landfill and also reduce the transport impacts associated with dedicated collections. For Contractor A, the opening of the facility being approximately 1 kilometre from their vehicle depot coupled with the increase in landfill tax and gate prices means that it is a more cost effective disposal route. Contractor C also stated that due to the proximal location of the MRF to their collection rounds, they may choose to use this facility in addition to their facilities near Birmingham.

## **6 Back-loading using reverse logistics networks**

From the analysis of waste collection operations, it is evident that 24% of surveyed businesses use delivery vehicles to remove some element of waste and/or recyclate from the High Street. Two different back-loading systems were used by businesses; 8.4% claimed to back-load all waste produced and a further 18% stated that they received dedicated collections for residual waste whilst using delivery vehicles to back-load recyclate. The characteristics of these systems will be discussed in more detail within this section of the report.

### **6.1 Back-loading of waste products**

There are certain key factors which determine whether back-loading waste and recyclate using the delivery fleet is viable, including:-

- Vehicle size
- Spare capacity on the vehicle
- Space and facilities at the distribution centre, head office or other store (end destination of vehicle) to store waste until it can be collected
- Frequency of deliveries and whether this is adequate in relation to the volumes of waste produced

The survey identified that 7 businesses claimed to back-load all waste and recyclate using their own fleet of delivery vehicles (mainly vans), the main characteristics of which are summarised in Table 20. The retailers were from the food/drink, footwear and other retail (bookshops, toys, chemist, stationers etc) retail categories

Although all waste produced was back-loaded in the same vehicle, cardboard was generally separated (and flat packed) from the residual waste stream so that it could be recycled. Businesses claiming to back-load all waste produced, received on average 3 collections per week with 2 stores receiving daily collections between Monday and Friday. The vehicle miles associated with the movements of waste and recyclate away from Winchester High Street to the respective distribution centre, head office or other stores were estimated for each of the 7 businesses. It is estimated that back-loaded waste is transported over 1371 km per week (Table 20, Figure 23). For 3 of the businesses, the waste was transported shorter distances to local sites e.g. Romsey, Salisbury and Winchester, but more frequently (5 times per week) than other back-loads. It was assumed that vehicles did not deliver to any other store to or from Winchester and the distances travelled are therefore likely to be an underestimate.

The reasons why businesses had chosen not to outsource waste management was not explored within the questionnaire. However, it is suggested that back-loading is potentially more viable and easier to manage when businesses use their own vehicle fleets to transport waste.

**Table 20:- Details of businesses claiming to back-load all waste and recycle generated from their premises**

Business ID.	Business category	Vehicle type	Coll. days	No. per week	Destination	Distance traveled per week (km)
10	Other retail	Van	Mon/Wed/Fri	3	Brighton	482.1
15	Other retail	Van	Mon-Fri	5	Romsey	91
46	Other retail	Van	Fri	1	Chichester	72.3
74	Other retail	Van	Mon-Fri	5	Winchester	13
33	Food/drink retail	Rigid	Wed	1	Nuneaton	243.9
38	Food/drink retail	Van	Mon-Fri	5	Salisbury	222.5
63	Footwear	Van	Tue	1	Leicester	245.8
<b>Total</b>						<b>1370.6</b>



**Figure 23:- Distribution of back loading destinations (green triangles) supplied by 7 Winchester High Street businesses**

## 6.2 Back-loading and contracted collections

For 15 businesses, combinations of 2 different collection systems were used to manage residual waste and recycle. In each case, waste contractors collected residual waste and delivery vehicles were used to back-load separated recycle (cardboard, plastic and polythene except one fast food outlet which back-loaded used oil). The retailers listed in Table 21 are all high street chain stores from a range of business categories which include clothing retail, food/drink, mobile phones and other retail.

For the businesses using combined, waste contractor and back-loading systems, 72% of back-loading was conducted by large delivery vehicles (rigid and artics) compared to the vans that were predominantly used by the retailers who claimed to back-load all their waste and recycle. In addition to businesses own vehicles which were used in 67% of back-loads, logistics providers *e.g. UPS, Tibbett and Britten, TNT* (20%) and suppliers *e.g. King, AAH* (13%) were also used to back-load recycle. This highlights the overall capacity of businesses to back-load on the High Street in that it need not be solely restricted to businesses using their own fleet of delivery vehicles.

In addition to back-loading collections, the 15 sampled businesses received on average 3 residual waste collections per week with 3 stores receiving daily collections Monday to Saturday (waste collection data were not available for 4 businesses). A total of 58 waste collections per week (including back-loading) were generated by 11 businesses that used 2 different collection systems (collection data were not available for 4 of the businesses) of which 55% were for residual waste collections (Figure 24, Table 21).

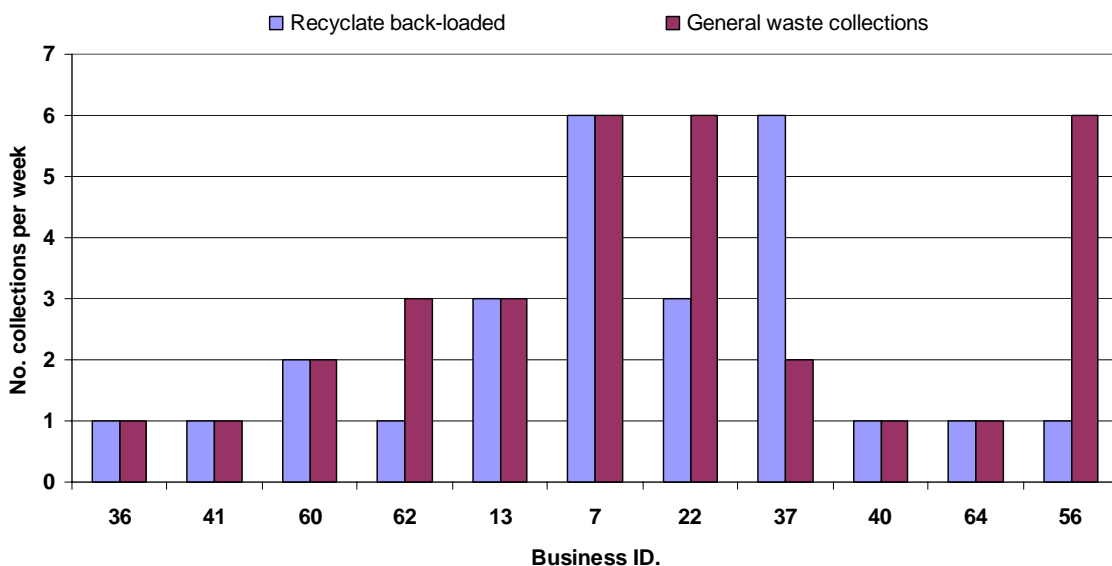


Figure 24:- Number of combined collections per week by individual business

**Table 21:- Details of business receiving waste collections and back-loading recycle**

Business ID	Business category	Vehicle type	Fleet	Back loaded material	Per week	Coll. day	Destination	Distance traveled per week (km)	Coll. day	No. residual waste collection Per week	Total No. vehicles Per week
36	Clothing retail	Rigid	BO	CD, PL, PR	1	Thu	Isleworth	90.6	Fri	1	2
41	Clothing retail	Van	LP	CD	1	NFD	Croydon	N/A	Tue	1	2
48	Clothing retail	Rigid	BO	CD, PL	3	Tue/Thu/Sat	Bristol	N/A	N/A	N/A	3*
60	Clothing retail	Van	BO	CD, PL	2	Tue/Thu	Milton Keynes	330.4	Tue/Thu	2	4
66	Clothing retail	Artic	BO	CD	1	Wed	Carlisle	575.6	N/A	N/A	1*
62	Food/drink retail	N/A	BO	CD	1	Thu	Bournemouth	N/A	Mon/Wed/Fri	3	4
13	Mobile phones	Van	LP	CD	3	Tue/Thu/Sat	Wednesbury	822.9	Tue/Thu/Sat	3	6
7	Other retail	Artic/rigid	BO	CD	6	Mon-Sat	Basingstoke	N/A	Mon-Sat	6	12
8 (back-loaded with above)	Opticians	Artic/rigid	BO	CD	6	Mon-Sat	Basingstoke	N/A	N/A	N/A	6*
22	Other retail	Rigid	BO	CD, PL, PY	3	Tue/Thu/Sat	Peterborough	N/A	Mon-Sat	6	9
37	Other retail	Rigid	LP	CD	6	Mon-Sat	Wigan	N/A	Tue/Thu	2	8
40	Other retail	Artic	SP	PY	1	Tue	Tamworth	N/A	NFD	1	2
44	Other retail	Rigid	BO	CD	1	Tue	Northampton	190.1	N/A	N/A	1*
65	Other retail	Rigid	BO	CD, PL	1	Wed	Crawley	N/A	N/A	1	2
56	Public house/restaurant	Rigid	SP	Oil	1	NFD	N/A	N/A	Mon-Sat	6	8
TOTAL					31			2099.6		33	58

Key:- BO – Business own, LP – Logistics Provider, SP – supplier, CD – cardboard, PL – plastic, PR – paper, PY – polythene, NFD – no fixed time, N/A – information not available, \* - doesn't not account for weekly waste collection

Four large retailers each received in excess of 8 collections per week (vehicles back-loading and dedicated waste collections). Equal numbers of back-loaded and contracted waste collections were observed at 6 business of which half were made on the same days. In these instances where collections are made on the same day, there could be scope for businesses to potentially collaborate and back-load all waste. The frequency of deliveries, the overall quantities of waste produced and subsequent demand for collections and compatibility of the vehicles are all factors that will determine whether back-loading residual waste is viable.

The locations of the main distribution centres used by 11 businesses are summarised in Figure 25. It was estimated that recyclate was transported over 2009 km per week for the 5 businesses where destination postcodes were available.



**Figure 25:- Distribution of back-loading destinations used by 11 businesses on Winchester High Street (blue triangles)**

## **7 Back-loading operational systems**

In order to understand how and why businesses on Winchester High Street use reverse logistics systems to manage waste, surveys were conducted with a health and beauty retailer (Retailer A) and 2 clothing retailers (Retailers B and C) all of which were chain stores.

### **7.1 Retailer A**

Retailer A has over 2000 stores (pharmacies, opticians and larger stores) across the UK selling a range of products (e.g. health and beauty products, opticians, pharmacies). These stores are serviced by 19 distribution centres (DC) with the facility at Basingstoke being used to service the Winchester branch.

#### **7.1.1 Collection rounds**

Retailer A has their own dedicated fleet of artic/rigid vehicles which make daily scheduled deliveries to Winchester between Monday and Saturday (night time between 03:00 and 04:00). The vehicle leaves the Basingstoke Distribution Centre, delivers to Eastleigh, Winchester Opticians and Health and Beauty stores before returning to the Distribution Centre traveling approximately 92.7 kilometres (round trip).

#### **7.1.2 Waste management procedures**

Residual waste generated by Retailer A is collected between Monday and Saturday (inclusive) by Contractor A. Cardboard, soft mixed plastic, bubble wrap, confidential waste, glass bottles, ribbon, disposable single use cameras, office paper, 35 ml pots are separated in-store and back-loaded in roll cages and black trays from all 3 stores on the round (2 of which are located on the High Street and the other is in Eastleigh 12 kilometres from Winchester) back to the Basingstoke DC between Monday-Saturday (inclusive).

#### **7.1.3 Processing of recyclate**

On arrival at Basingstoke all waste/materials are kept separate. Cardboard is compacted and collected by a cardboard recycler (the same company used by Contractor A) who transport it to Southampton where it is baled, bulked and transported to their mill in Kent. Other waste materials separated are back-loaded on delivery vehicles 258 kilometres to the Nottingham DC/Head Office where a range of contractors collect it for onward movement. With several vehicles making the trip between Basingstoke and Nottingham each day, the storage of recyclate at Basingstoke is not a problem.

## **7.2 Retailer B**

Retailer B is a company that has been involved in the design, manufacturing and retailing of womens clothes and accessories for 35 years and has over 42 outlets in the UK. These stores are serviced by a distribution centre located in Isleworth with the Swindon facility being used to service their other brand of clothing.

### **7.2.1 Collection rounds**

Retailer B currently use their own fleet of vehicles to deliver to 75% of stores, however, due to the geographical location of the northern branches it is more cost effective to sub-contract these deliveries. The vehicle leaves the Isleworth Distribution Centre, delivers to Winchester, Chichester and a department store in Southampton before returning back to Isleworth traveling approximately 323 kilometres (round trip).

### **7.2.2 Waste management procedures**

Residual waste generated by Retailer B in Winchester is collected every Friday by a waste contractor. Cardboard, plastic and paper which is separated in-store is back-loaded with the delivery vehicle to Isleworth DC every Thursday. Recyclate is also back-loaded from the Chichester branch but not the concession in John Lewis where all waste/recyclate is managed in-house. Cardboard is flat packed and transported in a roll cage whereas the plastic and paper are put in bags and stored in roll cages. Both Winchester and Chichester generate approximately 2 roll cages each of cardboard, plastic and paper each week which can double during February/March and October/November which is the peak period for deliveries.

Due to the geographical distribution of the stores the vehicle operates between 50-75% of its full capacity and therefore has the capacity to back-load more recyclate if required. In addition to recyclate, the delivery vehicle will collect stock transfers and back-load customer returns and display materials.

### **7.2.3 Processing of recyclate**

On arrival at the DC, the recyclate is taken to a designated area where it is bailed (separately) and stored until it is collected by a contractor; the details of this transaction have not been made available. Cardboard is collected monthly, paper every 6 weeks and plastic every two months. The frequency of collection is partially determined by compaction ratio. The DC also has the spare capacity to process more recyclate.

## **7.3 Retailer C**

Retailer C is a UK based retailer that sells a wider range of products including clothing (mens, womens and childrens), footwear, accessories and home products. It distributes through 3 main channels which include; 450 retail outlets in the UK; a mail order directory and over 140 stores overseas outlets. Other businesses within the group include a distribution network which has been described as Europe's most sophisticated

warehousing and distribution network, delivering into and servicing multiple retail stores as well as home and business addresses – from bulky consignments through to mail order. This network delivers to a wide range of retailers. A total of 9 distribution centres are located within the UK, with the facility at Bristol being used to service Retailer Cs Winchester Branch.

### **7.3.1 Collection rounds**

Retailer C has their own dedicated fleet of vehicles which make scheduled deliveries to Winchester on a Tuesday, Thursday and Saturday. Typically an “urban artic” is used to do this run, as it is shorter it is able to maneuver around Winchester. The vehicle leaves the Bristol Distribution Centre, delivers to Winchester, Bath before returning to the Distribution Centre traveling approximately 344 kilometres (round trip).

### **7.3.2 Waste management procedures**

Some residual waste generated at Winchester is collected by Contractor A (although no information was available for the collection days). All cardboard, plastic, polythene, tissue paper and some non-recyclable waste is separated in store, cardboard is flat packed and put in a P1 pallet sized box, all other recyclate is put in sacks and back-loaded in roll cages back to the distribution centre in Bristol on a Tuesday, Thursday and Saturday. Approximately 4-5 roll cages are back-loaded per store. The vehicle would have spare capacity to collect more recyclate if required. In addition to recyclate, the delivery vehicle collects stock transfers (including catalogue returns), customer returns, faulty WEEE, displays and shop fittings which are taken back to Bristol. Retailer C back loads from all 450 UK stores and has done so for the last 2 years. The volumes of recyclate generated was the one of the key reasons for back-loading via the DCs for processing and ensuring maximum financial return..

Retailer Cs subsidiary distribution company has a good established delivery network that delivers and takes-back from a range of High Street stores. It is suggested that the network and support systems are therefore in place to extend the service, theoretically collecting significant quantities of recyclate generated within the urban setting.

### **7.3.3 Processing of recyclate**

On arrival at Bristol all waste/recyclate is kept separate. The DC uses balers to process the recyclate. A Middleton Baler is used for cardboard and plastic which bales the recyclate into ½ tonne mill size bales in approximately 20 minutes, and a separate baler is used for paper. A recycling company (Retailer C has a national contract with this company to service all DCs in the UK) collects all bailed recyclate although the details of this transactions and destination of the material have not currently been made available. All non-recyclable waste is placed in a skip which is collected twice a week by the same contractor. Before the recycling system was in place at the depot, Retailer C generated approximately 2 skips of residual waste per day. Retailer C has opened a dedicated recycling facility at their distribution centre in Yorkshire.

#### 7.4 Summary of key operating characteristics

The key operating characteristics of 3 retailers' back-loading recyclate from Winchester High Street are summarised in Table 22. It was estimated that each week 10 vehicles travelled approximately 1913 kilometers to deliver goods and collect recyclate from the 3 High Street business. For Retailer B, approximately 2 roll cages were taken back each week whereas Retailer C back-loaded 15 roll cages in 3 collections per week. As these businesses only take back recyclate, additional collections are required to manage residual waste although a clothing retailer received dedicated collections in addition to back-loading residual waste.

**Table 22: Summary of back-loading case studies**

	<b><i>Retailer A</i></b>	<b><i>Retailer B</i></b>	<b><i>Retailer C</i></b>
<b>Business category</b>	Other retail	Clothing retail	Clothing retail
<b>Type of waste collection system</b>	Waste collection/back-load	Waste collection/back-load	Back-load/waste collection
<b>No. stores/UK</b>	>2000	42	450
<b>Type of distribution system</b>	Centralised	Centralised	Centralised
<b>Waste back-loaded</b>	Cardboard, soft mixed plastic, bubble wrap	Cardboard, plastic and paper	Cardboard, plastic, polythene
<b>Quantities collected/week</b>	Varies	2 roll cages/per week	15 roll cages/per week
<b>Vehicle used</b>	Artic/rigid	7.5 tonne rigid	Urban arctic
<b>Days of collection</b>	Monday to Saturday	Thursday	Tuesday, Thursday and Saturday
<b>Location of D.C</b>	Basingstoke	Isleworth, London	Bristol
<b>Type of round</b>	Milk round	Milk round	Milk round
<b>Total No. vehicles/week</b>	6	1	3
<b>Residual waste/week</b>	6	1	Info not available
<b>Residual set out/week</b>	6600 litres	1100 litres	Info not available
<b>Deliveries</b>	Eastleigh Winchester x2 stores	Winchester Chichester John Lewis (no back-loading)	Winchester Bath
<b>Distance travelled per round/per week (km)</b>	93/558 km	323 km	344/1032 km

It is estimated that over 17 vehicles were used to remove residual waste and recyclate each week from these 3 stores of which 88% of activity was generated by Retailer A, who received daily back-loads and residual waste collections (Monday to Saturday). For this business it is suggested that as collections are made on the same day, the number of collection vehicles generated by their activity could be halved if they back-loaded all waste and recyclate. Evidently, delivery vehicles would have to have spare capacity to take back the 1100 litres of residual waste typically set out for collection each day and have the infrastructure in place in the distribution centre. However, the ability to back-load residual waste will also depend on the nature of the business, the types of waste produced and crucially, the issues associated with potential contamination of 'core' goods delivered to the store. The environmental benefits associated with

increased material recovery and the financial savings made from reduced collection and disposal costs and the revenue generated from the sale of the recyclate were identified as the main reasons why businesses used delivery vehicles to back-load recyclate.

#### **7.4.1 Similarities in operating characteristics**

It is evident from this review that there are some key similarities and differences in how retailers back-load waste/recyclate, these have been summarised.

- Each business used a combination of the 2 collection systems in which recyclate was back-loaded and residual waste collected by a waste contractor (except Retailer C that did back-load some residual waste in addition to receiving residual waste collections).
- Each retailer took advantage of their centralised distribution systems to channel recyclate back on their delivery vehicles.
- Cardboard, paper and plastics were the main types of materials separated in-store and contained into sacks, roll cages or plastic pallets and back-loaded on to businesses own delivery vehicles (mainly rigid or artics).
- Separation was typically conducted in-store as it was considered to be more cost effective than separation at the distribution centre and it also generated a better quality of recyclate.
- By back-loading recyclate which has a market resale value, retailers are able to add value to an otherwise empty return journey back to the distribution centre which in addition to the legal requirements (including Packaging Waste Regulations) provides businesses with an incentive to utilise reverse logistics networks to improve their recycling performance.
- Collections from Winchester were typically part of multi-drop delivery rounds in which up to 2 other deliveries/collections were made per route.
- Retailer A and B, both received equal numbers of contracted and back-loaded collections each week e.g. Retailer A back-loaded on 6 delivery vehicles and received 6 residual waste collections
- Each retailer was able to back-load recyclate from the majority of their branches in the UK due to having their own dedicated vehicle fleet, spare capacity on the vehicles and also adequate facilities at the distribution centres.
- All waste/recyclate was back-loaded to facilities outside of Hampshire.

#### **7.4.2 Differences in operating characteristics**

- The frequency of deliveries and subsequent ability to back-load varied between each retailer (once a week to daily Monday to Saturday).
- The distance travelled per delivery round varied between retailer depending on the location of other branches on the round and the location of the DC (ranging between 93 to 344 kilometres).
- After back-loading all recyclate to the DC in Basingstoke, Retailer A separated cardboard and back-loaded other recyclate to the main DC in Nottingham.

## **8 Disposal of waste at HWRCs**

This report has highlighted that there are 3 main waste collection systems used by businesses on Winchester High Street; contracted collection, back-loading by delivery vehicles and a combination of the two. The survey also identified 10 businesses (12%) that used local Household Waste Recycling Centres (HWRCs) to dispose of specific waste streams free of charge rather than paying for separate collections or back-loading. The majority (80%) used these sites to dispose of cardboard or fluorescent tubes in addition to receiving dedicated residual waste collections. As fluorescent tubes are classed as hazardous waste, businesses have a legal obligation to ensure that they are separated from the residual waste stream and collected by an authorised waste management company (Hazardous Waste Regulations, 2005). Although Winchester HWRC is authorized to recover and dispose of fluorescent tubes, it is not licensed to accept any commercial, trade or industrial wastes.

It is estimated that the overall bill to the council taxpayer from traders using HWRCs in Hampshire will soon be more than £1 million a year due to increasing landfill taxes and disposal costs (Hampshire County Council, 2009). With trade waste volumes estimated to be approximately 18% of site input (estimates following independent site surveys, Morethanwaste, 2009), a number of measures have been introduced on sites to prevent wrongful misuse including automatic number plate recognition, height barriers, permits schemes for vans and trailers (permitting householders to use sites), household permit schemes, meet and greet systems and detailed waste acceptance policies (Network Recycling, 2004).

Businesses currently using these sites should be outsourcing collections to existing contractors or appropriate alternatives. The questionnaire did not identify the reasons why businesses chose not to arrange for separate contracted collections. However, it is suggested that the cost associated with additional collections, particularly for small independent retailers, coupled with limited volumes of waste generated could have contributed to the decision making process.

### **8.1 Trade waste at HWRC case studies**

Despite the licensing restrictions imposed on the disposal of trade waste at HWRCs in Hampshire, there are a number of examples within the UK and in Europe where operating procedures have been adapted to allow for the disposal of trade waste, particularly to benefit the small business.

#### **8.1.1 Harrogate and Northallerton HWRCs**

Harrogate and Northallerton HWRCs (North Yorkshire) provide businesses with an outlet to dispose of residual and recyclable waste types excluding chemical waste, clinical waste, scrap vehicles, WEEE, asbestos or any excessive amounts of trade waste where it detracts from the service provided to householders. Businesses are required to display proof of registration in the window of their vehicle, agree the volume and type of waste being disposed of with site staff before completing a Controlled Waste Transfer

Note and Receipt. The pricing schedule is determined by the type (active and non active) and amount of material taken to the sites (vehicle loads where 1 vehicle equates to a standard short wheel base transit van or 90 litre bags), Table 23. It is cheaper for businesses to dispose of non active recyclable waste which acts as an incentive for all wastes to be separated on-site, Trade waste is only accepted Monday to Friday, with the exception of Bank Holidays.

**Table 23: Pricing schedule 2008/9 for the disposal of trade waste at Harrogate and Northallerton HWRCs (North Yorkshire, 2008)<sup>1</sup>**

Volume	Active waste including VAT	Non Active waste including VAT
0-1/2 load	£30.00	£17.63
½-1 loads	£60.00	£35.25
1-1½ loads	£90.00	£56.40
1½-2 loads	£120.00	£70.50
1-5 bags	£12.00	£7.05
6-10 bags	£24.00	£14.10

### **8.1.2 Waun-y-Pound Trade Eco-centre (Ebbw Vale)**

The Waun-y-Pound Trade Eco-centre (Ebbw Vale, Wales) enables businesses to dispose of a range of recyclable materials only (no residual waste or rubble) including green waste, scrap metal, wood, glass containers, jars and steel free of charge. The site allows the disposal of trade waste in an attempt to reduce fly tipping in the borough while assisting businesses to reduce their disposal liability. There are no vehicle restrictions for traders but unlike householders they are only able to visit the recycling containers.

### **8.1.3 Bruslee Recycling and Civic Amenity Site (Newtonabbey, Northern Ireland)**

The Bruslee Recycling and Civic Amenity Site (Newton Abbey, Northern Ireland) enables businesses to dispose of mixed general waste and green waste at a charge of £78.30/per tonne and £39.10/per tonne, respectively (Newton Abbey, 2008). Businesses wishing to use the facilities are required to register with the council and a minimum disposal of a tonne is required to be paid in advance of using the site. A swipe card system is used to charge users via their trade account and all vehicles are weighed using the on-site weighbridge. As with the other case studies, businesses use the facilities along side householders.

### **8.1.4 Proefuinstraat Container Park (Flanders)**

The Proefuinstraat Container Park (Ghent, Flanders) is only open for trade waste on a Monday when it is closed to householders. Traders are required to dispose of materials in a designated area. A variable charging system is used with lower rates for recyclable materials and higher for residual waste, building and hazardous wastes (Network Recycling, 2004).

The 3 case studies within the UK highlight that trade waste, whether residual and/or recyclate is being disposed of along side domestic waste at HWRC facilities. In each case, businesses are required to register with the council prior to disposal and are typically charged in accordance to the types and volumes/weight of waste taken to the site, the main exception being in Ebbw Vale where disposal of recyclate is free of charge. Unlike the UK case studies, the Proefuinstraat Container Park in Belguim, only accepts trade waste on a Monday when the site is closed to householders.

The wider benefits of these systems are that they can provide an additional, more cost affective outlet for the disposal of trade waste for 'occasional' users. They can also help prevent illegal fly tipping in the surrounding area.

## 9 Sustainable approaches to retail waste collection in an urban centre

Managing recyclate, in terms of minimising the costs associated with its separation and transport, whilst maximising any value that can be gained through its recovery, is becoming of increasing interest as part of integrated supply chain management strategies. As a result, many innovative take-back systems have been developed, catering for a wide variety of materials, targeted often at small to medium sized businesses who do not generate significant volumes of recyclate to warrant a contract with a major waste contractor, but nevertheless have to comply with their obligations under waste management legislation.

In terms of implementing more sustainable waste collection systems, increased co-ordinated take-back using back-loaded delivery vehicles and combined domestic and commercial waste collections have considerable potential. Co-ordinated through the local collection authority, these types of combined collection could effectively cater for additional small-volume recyclate consignments on top of the domestic set out, and potentially encourage SMEs to recycle more material.

### 9.1 Co-ordinated take-back

Utilising the existing delivery mechanisms serving a retail centre to take-back recyclate has the potential to reduce the transport footprint associated with waste management in urban centres. If the combined transport resources across different supply chains could be pooled in some way to create shared take-back schemes among businesses producing similar types of waste, then considerable environmental and financial savings could be gained. Within such a system, pooled recyclate could be taken to an out-of-town groupage facility e.g. an adapted park-and-ride site or an existing delivery consolidation centre, or could alternatively be back-loaded to a distribution centre.

#### 9.1.1 Volumes of cardboard produced on the High Street

As cardboard constitutes approximately 50% of the total waste output generated by businesses on Winchester High Street, it represents a vast resource which at present is not being fully exploited. The potential volume of cardboard that could be produced has been estimated for 36 High Street businesses using the volumes of residual waste set out for collection each week (see equation below) and the percentage of waste estimated to be cardboard (based on data collated from the business managers' surveys).

$$\text{Volumes of cardboard produced each week} = (\text{No. 360L bins} \times 360\text{L}) + (\text{No. 1100L bins} \times 1100\text{L}) + (\text{No. 90L sacks} \times 90\text{L}) \times \text{No. collections per week} \times \% \text{ of waste estimated to be cardboard}$$

It was estimated that each business generated on average 1299 litres (ranging from 0 to 10,340 litres/week) of cardboard each week, or 1.23 roll cage equivalents. These calculations have been used to project the volumes of cardboard produced by all 107 businesses on the High Street. From these projections it was estimated that 139,007 litres of

cardboard or 131 roll-cage equivalents could be produced each week (Table 24). It should be noted that these initial calculations are based on the following assumptions:

- All cardboard is flattened and stacked vertically into roll-cages (1060 litres) which are all uniform in size and easily maneuverable.
- All receptacles used were full to capacity when they were set out for collection. Although realistically this might not always be the case, the assumption seems reasonable as businesses are unlikely to pay for a receptacle that does not meet their business needs.
- Every High Street business generates cardboard, although from the business surveys it is evident that several businesses claimed that they did not produce any from their business activity. It is suggested that this would balance out across the High Street with some businesses generating above average volumes of cardboard.
- Based on discussions with Biffa and Serco, all sacks used were assumed to be able to contain 90 litres of waste/recyclate

**Table 24: Estimated cardboard volume per business per week**

<b>Business</b>	<b>Sample</b>	<b>Litres of cardboard</b>	<b>roll-cage equivalent</b>
Average per business	36	1300 (0-10340)	1.23 (0-9.8)
standard deviation		2211	2.09
High Street	107	139000	131

### 9.1.2 Operational requirements

In order to calculate how many vehicles would be required to transport the cardboard from the High Street, the average fill rates and spare capacity on delivery vehicles was derived using data presented in the DfT Freight Best Practice Benchmarking Guide (DfT 2006). A DfT survey of 22 vehicle fleets involved in non-food retail indicated that the average fill rates at the start of trips were 58% by volume, 62% by weight and 84% by deck area (i.e. floor space), DfT, 2006. When averaged over all legs of the trips, these figures reduced to 51% by volume, 54% by weight and 74% by deck area, the reductions being due to deliveries being made on multi-drop rounds. These data originated from a number of major retailers including Marks and Spencer, John Lewis, B&Q, Argos, Woolworths and Littlewoods.

Based on these data, it was assumed that for a typical 18 tonne rigid vehicle, 26% of the deck area (5.6m<sup>2</sup>) would be free after completing a delivery which would be enough spare capacity to collect 9 roll cages (floor area of a roll cage 0.63m<sup>2</sup>) of cardboard. Therefore with the High Street generating 131 roll-cage of cardboard (139,000 litres), a minimum of 15 vehicle trips would be required per week or 3 per weekday (Monday to Friday) to either back-load it on delivery vehicles to distribution centres or to transfer it to a local designated groupage facility for onward collection. In both cases, a few larger businesses, operating through centralised distribution systems would be required to participate in the system as no one business would be likely to have the necessary capacity to collect cardboard with the required level of frequency. There would also be more cover for unforeseen eventualities with several logistics providers involved..

Vehicle requirements have been calculated for various alternative scenarios including an increase in the spare capacity on vehicles (50%) and varying receptacle fill rates (125%, 75% and 50%), Table 25. The results suggested that only 4 vehicle trips would be required

each week if 50% less cardboard was produced and the vehicles had 50% spare capacity after finishing deliveries at the retailer. Evidently the number of vehicle trips required to service the system will increase as the volumes of cardboard produced increases and the spare capacity on the vehicle decreases.

Whether being transported to a groupage facility or to a distribution centre, a holding area with adequate capacity to store the cardboard until it is collected by a cardboard recycler is required. Using the 131 roll cages that could be generated by the High Street businesses per week, it was estimated that a holding area of 83m<sup>2</sup> (131 roll cages x 0.63m<sup>2</sup>) would be required if a recycler collected at least once a week (Table 25). This does not include any marshalling space for vehicles, office facilities or associated infrastructure. Due to the volumes of cardboard generated each week (and depending on the capacity of the collection vehicles) more frequent collections would be required from the groupage facility which would reduce the space needed for the holding area.

**Table 25: Collection scenarios based on variability in bin and vehicle fill rates**

Bin fill rate	Cardboard	Vehicle fill (deck area)	Spare capacity		No. of roll-cages	No. of vehicle trips needed	Size of holding area
			Deck area	Roll cage			
%	litres	%	m <sup>2</sup>			Per week	m <sup>2</sup>
125%	173750	74%	5.6	8.9	164	18	103
100%	139000	74%	5.6	8.9	131	15	83
75%	104250	74%	5.6	8.9	98	11	62
50%	69500	74%	5.6	8.9	66	8	41
125%	173750	50%	10.8	17.2	164	10	103
100%	139000	50%	10.8	17.2	131	8	83
75%	104250	50%	10.8	17.2	98	6	62
50%	69500	50%	10.8	17.2	66	4	41

It is likely that a take-back scheme for the whole high street would not be required as 55 businesses already reduced the need for additional recycling collections by either back-loading some of the waste/recyclate or by using a contractor who sent all residual waste to an energy-for-waste plant. It was estimated that a scaled down scheme servicing only 28 businesses would only require 4 vehicle trips each week to transfer 38 roll cages (39,873 litres) of cardboard from the High Street (Table 26). Due to the reduced numbers of businesses and volumes of waste involved, such a scheme could be managed by a single business on the High Street. However, peak trading periods could see a doubling of the waste output from some retailers and this could have a significant impact on the number of vehicles required during the October to December period.

**Table 26: Collection scenarios based on variability in bin and vehicle fill rates for 28 businesses (not using Serco or back-loading)**

Bin fill rate	Cardboard	Vehicle fill (deck area)	Spare capacity		No. of roll-cages	No. of vehicle trips needed	Size of holding area
			Deck area	Roll cage			
%	litres	%	m <sup>2</sup>				m <sup>2</sup>
125%	49842	74%	5.6	8.9	47	5	30
100%	39873	74%	5.6	8.9	38	4	24
75%	29905	74%	5.6	8.9	28	3	18
50%	19937	74%	5.6	8.9	19	2	12
125%	49842	50%	10.8	17.2	47	3	30
100%	39873	50%	10.8	17.2	38	2	24
75%	29905	50%	10.8	17.2	28	2	18
50%	19937	50%	10.8	17.2	19	1	12

### 9.1.3 Feasibility of coordinated take back

Although the business survey identified that 45% of High Street retailers would consider collaborating with their neighbours to improve material recovery, the feasibility of such a system is dependant on numerous factors including:

- The engagement of High Street businesses to participate within the service in the first instance.
- The engagement of larger retailers with the infrastructure and willingness to extend their take-back services to neighbouring businesses. (In this case, the retailer providing the take-back would gain the financial benefit from the additional recyclate generated).
- Introduction of an incentive scheme to encourage participation (e.g. the local authority covering the Waste Carrier's License, tax incentives, priority for using existing unloading bays).
- A business case for participation e.g. cost savings, meeting legal requirements and improving environmental performance.
- As storage space is an issue for many businesses, it might be impractical to use roll-cages as the medium to store and transfer the cardboard to the groupage facility or DC.
- Collaboration between all parties involved (businesses generating cardboard and those collecting it) is required to ensure that the cardboard is presented in the correct manner (roll-cages) at the exact time and location determined by those managing the transfer.
- Identification of a suitable groupage site which would need to be located in an area with good access and sufficient space to store the cardboard.
- Additional capacity within the system to process additional volumes of waste (particularly given the variability in volumes that can be experienced during peak times), the distribution centres ability to handle these and the delivery round structures.
- The overall costs associated with manning and running the groupage site and how this is passed on to participating businesses. Also, the rules governing which

contractors/logistics providers could collect recyclate from the groupage site and how the financial gains are passed down to the parties involved.

- The fulfillment of all legal requirements including the issuing of waste transfer notes (Duty of Care, 1991) and obtaining waste carrier certificates costing £152 (2009-10) (Controlled Waste (Register of carriers and seizure of vehicles) Regulations 1991) and environmental permits (or registering for exemptions).
- Branding issues associated with waste and recyclate from a potential rival business being loaded into the liveried vehicles or another could deter participation.
- The current decline in the market value of recyclate may discourage retailers from back-loading. China is a key end-market for recyclate originating from the UK and Autumn 2008 saw a sharp tail off in demand, largely due to the economic downturn, with prices for paper and plastic falling between 40 and 60% in one month alone. As a direct response, exports of recovered paper fell by 40% between October and November 2008 (WRAP, 2009).

## **9.2 Combined commercial and domestic collection**

In addition to providing a domestic waste collection service, Local Authorities may offer a commercial waste collection service which uses a dedicated vehicle fleet and operates as a completely separate entity. As commercial waste collections count towards an authority's, 'Landfill Allowance Trading Scheme' (LATS) targets, there is an incentive for recoverable materials from the trade waste streams to be diverted from landfill (Defra, 2005). Within the UK there are a few examples of waste collection authorities facilitating the collection of domestic and commercial waste as part of the same collection round. For recyclate collection, this appears to be a much more efficient use of transport resources as domestic and retail areas can be covered using the same vehicle fleet as part of the same round.

The New Forest District Council (NFDC) has operated such a joint commercial/domestic waste collection service, allowing SME's to put out recyclate for collection as part of the domestic round (McLeod and Cherrett, 2006). Commercial waste is collected primarily from SMEs who have pre-registered with the council and have acquired a 'duty-of-care' certificate (defined under the Control of Pollution Act 1974, the Collection and Disposal of Waste Regulations 1984 and the Environmental Protection Act 1990). This waste is collected on the same rounds as the domestic waste which has separate residual and recyclate rounds. In research undertaken in 2006 (McLeod and Cherrett, 2006), thirteen weekly residual waste rounds were operated by NFDC with the proportion of commercial waste collected ranging from 0.1% to 3.2%, based on estimated figures. NFDC estimated that 97.5 tonnes of commercial recyclable waste was collected during 2005/06 on the domestic rounds. Such a system is ideally suited to High Street businesses who may be producing small quantities of cardboard and do not want to sign up to a large scale commercial collection service. The ability of an existing domestic round to collect additional waste is dependent on the spare capacity in the refuse collection vehicle (RCV). Spare capacity is needed in terms of both physical space and also in the amount of time available for collecting due to the time constraints associated crew shift patterns and the operating hours of waste treatment/disposal facilities. All commercial waste collected as part of a joint collection has to be separated out prior to treatment to meet legal requirements. Research undertaken by McLeod and Cherrett (2006) looking at theoretical joint domestic/commercial collection rounds across Hart and Rushmoor suggested that a commercial waste load of 3.9 tonnes/fortnight could be readily accommodated on the existing domestic rounds, without increasing the number of trips required to the waste disposal site.

## 10 References

- Biffa (2007). The UK Landfill Regulations Pre-treatment Requirements. Available at <http://www.biffa.co.uk/content.php?id=325>. [Accessed: 19 June 2009]
- DfT (2006) Key Performance Indicators for Non-Food Retail Distribution. Freight Best Practice Benchmarking Guide.
- Environment and Heritage Services. (2002). Industrial and Commercial Waste Production in Northern Ireland. Available at [http://www.ehsni.gov.uk/industrialcommercialwasteproduction\\_ni2002\\_appendices.pdf](http://www.ehsni.gov.uk/industrialcommercialwasteproduction_ni2002_appendices.pdf).
- Hampshire County Council. (2009). Available at <http://www3.hants.gov.uk/waste-and-recycling/tradewastecontrols/hwrcpermit-faqs/faqs.trade-waste#q2>. [Accessed: 25 June 2009]
- Keep Wales Tidy and ESRC BRASS (2004). Cardiff Retail Survey 2003-4.
- Maynard, S.J. and Cherrett, T.J. (2006). Transport impacts of household waste recycling centres. Waste and Resource Management, Issue WR1, pages 13-21.
- McLeod, F., and Cherrett, T.J. (2006). Optimising Vehicles Undertaking Waste Collection. Final Report for the DfT. September 2006. Unpublished.
- Morethanwaste. (2009). Available at <http://www.morethanwaste.com/Site/Default.aspx/87487B5E0BA606AF7B78>. [Accessed: 25 June 2009]
- Network Recycling. (2004). The National Assessment of Civic Amenity Sites. Maximising Recycling at Civic Amenity Sites. 2004.
- Newtonabbey Borough Council. (2008). Bruslee Recycling and Civic Amenity Site Advice for Commercial Traders. Available at [http://www.newtownabbey.gov.uk/recycle/bruslee\\_business.asp](http://www.newtownabbey.gov.uk/recycle/bruslee_business.asp). [Accessed: 25 June 2009]
- North Yorkshire Borough Council. (2008). Household Waste Recycling Centres Conditions of Use/Registration Form to Deliver Commercial Waste. Available at <http://www.northyorks.gov.uk/CHttpHandler.ashx?id=2065&p=0>. [Accessed: 25 June 2009]
- Swap. (2002). Westminster waste analysis project – final report.