

Understanding retail supply chains to enable 'greener' logistics – A case study of 'delivery' and 'take-back' mechanisms in Winchester

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Key findings

A survey of 69% (n=83) of the 120 business managers on Winchester High Street revealed the following about their core goods deliveries and service visits:

Core goods delivery activity

Non-peak activity

1. 618 core goods delivery visits may be made each week to the 120 businesses on Winchester High Street.
2. 5.8/business/week based on data from 79 respondents
3. Across 26 UK urban freight studies, the average business received 9.2 deliveries per week (standard deviation, 5.8)
4. Charity shops, clothing retailers and 'other services' (including estate agents and travel agencies) received the least number of weekly core goods deliveries (less than 3 per week on average), while food and drink retailers and footwear retailers received over 7 deliveries per week on average.
5. Only 8% of the businesses surveyed said that they received goods on an 'on-demand' basis from their main supplier with the majority organising scheduled deliveries.
6. Businesses using decentralised logistics systems received significantly more weekly core goods deliveries (9.1) compared to centralised stores (3.6), $T_{(39)}=3.05$, $p=0.003$, around three times the number. Similar results were found in the 1999 Norwich and London studies where decentralised served stores generated 14.2 weekly core goods deliveries on average (Median, 10) with centralised served stores receiving 4.5 (median, 2.5).
7. On average across the respondents (centralised and decentralised systems combined), one provider was responsible for 82% of the delivery vehicle activity to their business, equating to 3.1 deliveries out of 5.8 on average per week.
8. Across the 37 decentralised stores, 1 supplier/logistics provider accounted for 68% of the vehicle activity to the average business
9. Hotels, generated 24.5 core goods deliveries per week on average, which could include linen and food.
10. A courier vehicle visiting Winchester would typically deliver packages to 48 separate businesses during a vehicle round (SD 18.1), ranging from 30 to 80, and make 14 separate collections (SD 8.7). Data from 6 companies suggested that an average courier would make 10 vehicle trips (SD 3.9) during a typical week (6 working days) to deliver packages to 413 businesses in the Winchester area. Common practice was to make collections in the afternoon once the final delivery had been made, typically from 15:00.
11. The average courier would expect to make 66% more delivery trips to businesses in Winchester during the Christmas period (7 more trips per week in addition to the 10 non-peak trips usually made).
12. There did not appear to be a strong correlation between store size and the number of core goods deliveries received per week (0.13)
13. Mobile phone stores and jewellers were the smallest in terms of sales area but generated the greatest number of weekly core goods movements per 100m² sales area (7.29 and 4.67 respectively)

It can often be assumed that large national chain stores present on a high street can be associated with significant proportions of the observed freight vehicle activity, whether it be for core goods delivery or service provision. In a lot of cases, these types of business, serviced through centralised distribution systems, can be linked with large rigid or HGV deliveries on a scheduled basis. However, the results from Winchester suggest that smaller, specialist stores can be responsible for considerable freight vehicle activity, albeit in smaller vans, and in terms of town planning, one should not assume that larger retailers (over 500m² sales area) are the most likely generators of freight delivery traffic, and should therefore get preferential treatment in terms of access/infrastructure provision.

Peak activity

14. 87% of the High Street businesses considered December to be their busiest trading month with February being the quietest period.
15. 25% more deliveries would be made to the average business during a peak trading week (potentially 2.4 deliveries per week).
16. There were significant differences between the clothing, food, 'other retail', personal services and 'other services' business categories in the ratio of additional peak period weekly deliveries to the typical non-peak number, ($F_{(4,93)} = 2.7$, $P=0.035$, $Mse = 0.19$), with the average clothing retailer receiving 51% more deliveries during the pre-Christmas build-up.
17. Across all business categories, 21% received additional delivery vehicles from their main supplier/logistics provider whilst 57% saw increases in consignment sizes but no increases in the number of deliveries made.

This has highlighted that although one would expect a retailer to receive more core goods deliveries in the build up to Christmas (looking across all their supplier base), their primary goods supplier, responsible for up to 82% of their stock, may not generate additional vehicle visits during this period but may just increase the mean consignment size. Research suggests that retailers expecting at least a doubling in the quantity of goods delivered were cards and gifts shops, clothing retailers, entertainment retailers, food, home furnishings and jewellery stores and toy shops.

Delivery characteristics

18. There were no significant differences in the proportions of artics/rigids and vans used by High Street businesses served by centralised and decentralised systems ($\chi^2 = 0.57$ and $\chi^2_{(0.05)} (1df) = 3.84$)
19. In 58% of cases, vans were used to make these deliveries with 31% being undertaken by rigid lorries

In nine out of the twelve establishment surveys involving retailers undertaken since 2001, vans ('light goods vehicles') were the dominant mode, and across all the studies, were responsible for 42% of the delivery activity on average, perhaps suggesting the influence of the major carriers on store deliveries and also the issues of accessing often congested urban centres with larger delivery vehicles.

20. Tuesdays and Wednesdays saw the greatest delivery vehicle activity with significantly less being undertaken at the weekends ($\chi^2 = 88.02$ and $\chi^2_{(0.05)} (10df) = 18.3$, slightly at odds with the results from other urban freight studies which found that Friday's generally recorded the most delivery activity (8 out of 15 studies), whilst Monday's tended to be the quietest day for freight vehicle activity
21. 43% of the core goods deliveries made by the businesses most common logistics provider/supplier occurred between 04:00 and 12:00. Across 11 freight surveys, 49% of 2178 observed delivery times related to a morning delivery before 12:00. No significant differences were observed between the delivery times of stores served through centralised and decentralised logistics systems.
22. 26% of businesses did not have a set delivery time arranged and the goods could arrive at any time during the working day.
23. There were significant differences between the mean dwell times of articulated vehicles, rigids and vans ($F_{(2,190)} = 20.9$, $P<0.001$, $Mse = 0.89$). The results were in line with other urban freight surveys which have suggested that on average, mean dwell times for HGV's were 31 minutes, rigids 19 minutes, vans 10 minutes and cars 8 minutes.
24. Logistics providers and couriers recorded the shortest mean van dwell times of 9 minutes and 8 minutes respectively.

Where vehicles were owned by the business concerned, the dwell times were found to be considerably more (over 20 minutes) suggesting that deliveries might involve multiple consignments or be more complex owing to the nature of the goods or the activity of the vehicle whilst at the premises.

25. There was no strong correlation between store size and the mean dwell time of core goods delivery vehicles (0.12)
26. Mean dwell times of vehicles coming from decentralised distribution systems were not significantly quicker (14.5 minutes) compared to those from centralised systems (16.9 minutes), $T_{(71)}=0.76$, $p=0.45$.
27. Jewellers, mobile phone retailers and opticians recorded the quickest dwell times with delivery vehicles from the main supplier/logistics provider all taking under 10 minutes on average.
28. Approximately 173 hours of delivery activity could take place serving the 120 businesses on the High Street each week (1 hour 27 minutes per business per week). Taking a 5-day week, this could equate to 17 minutes of delivery dwell time per business each week day, of which 73% (13 minutes) could occur on-street.
29. Taking the average figure of 42% van activity across all road-based deliveries from 12 urban freight studies undertaken since 2001, 73 hours of van deliveries might be experienced per week across the High Street retailers (37 minutes per week per business or 7.4 minutes per day).
30. 58% of the respondents (n=71) stated that the typical delivery from their main supplier/logistics provider was made up of loose boxes.
31. The average business might receive 9 small, 17 medium and 10 large boxes in a typical delivery from its main supplier. The driver and/or the business staff would expect to handball the packages from the vehicle in over 50% of cases.

Returns and backloading

32. 41% of businesses stated that they did not utilise any back-loading capability.
33. 45% of respondents did back load the main suppliers/logistics provider's delivery vehicles with stock for return to the supplier/distribution centre.
34. 23% of retailers said they used 'dedicated' returns providers (from the charity shop, clothing retail, footwear, mobile phone, and optician business categories)
35. 72% of respondents operated a returns policy while 87% had a website of which 94% offered on-line purchasing of goods. Of the 49 businesses offering on-line shopping in addition to their High Street store, 26 (53%) allowed goods that had been purchased on-line to be taken back to the High Street store under their customer returns policy.
36. 54% had the same return period for both their high street store and the online equivalent.
37. 28% indicated that they required goods to be returned in the original packaging while 80% needed proof of purchase
38. 28% of businesses stated that they did not inspect returns in store.
39. 60% of businesses attempted to return items to Grade-A stock for re-sale in-store, with the clothing, footwear and jewellery business categories putting over 80% of returns back to grade-A stock on average.
40. The average distance travelled by a return to the next point in the reverse chain was 86 miles (138 km)

Service vehicle activity in urban centres

41. In addition to the estimated 618 core goods deliveries received during a typical week by the businesses on the High Street (5.8/week/business on average), an additional 1049 service visits (9.8/week/business) may also take place
42. The most common service visits were for post delivery (3.3/business/week) and waste collection (2.4/business/week) on average.
43. Across 8 UK urban freight studies, service trips on average accounted for 47% of the total delivery and service vehicle activity with 5 of the studies reporting a share of over 51%.
44. During a typical, non-peak trading week, one could expect 9% of businesses to receive engineer visits for the maintenance of computer equipment, 21% for security equipment, 6% for lift/escalator overhaul and 4% visits for pest control.
45. The overall mean dwell time across all service categories (including postal deliveries) was estimated at 30 minutes.
46. Over 70% of service visits may be made by motorised transport, of which approximately 43% are vans.
47. 4 hours 11 minutes of service activity per week could be a routine occurrence at the typical

high street business in Winchester (50 minutes per day assuming 5 days). Assuming that 70% of this would involve motorised transport (2 hours and 56 minutes) and that 38% could be parked on-street, the average business could generate a minimum of 1 hour and 7 minutes of service vehicle dwell time on-street per week (13 minutes per day assuming 5 days).

48. From 13 service providers, 438 separate clients were visited across the wider Winchester area (incorporating the central city, Bar End and Winnall), generating approximately 147 weekly trips.
49. 39% of the service providers followed a pre-arranged schedule with their clients.
50. Over 70% of service trips originated locally, either from a local branch office or an engineers home. 77% stated that vehicles were kept at an employee's home.

Service vehicle activity is clearly a significant contributor to urban freight movements and due to its very nature, often requires vehicles to be parked close to the premises being served. In terms of business processes that could be targeted to reduce overall freight vehicle impacts, centrally co-ordinating elements of service provision (e.g. for cleaning, equipment maintenance, recyclate collection), or providing improved, more flexible parking provision for service vehicles could be more beneficial in reducing overall freight impacts than focusing on core goods deliveries. In the case of the latter, 'pay-as-you-leave' car park charging systems could encourage short-stay service vehicles to park off-street.

1 Background

Over the past 30 years, there have been many urban freight surveys undertaken by local authorities across the UK, in an attempt to understand freight issues at the local level (Allen et al., 2008). Many of these focused on the supply chains delivering 'core' goods to retailers whilst some made an attempt to go further and quantify the impacts of service vehicle activity to gain a more complete picture of freight vehicle impacts serving our central business districts. This paper describes a detailed business managers survey undertaken on retailers in Winchester High Street (n=83, 69%), designed to quantify the vehicle activity associated with supplying core goods, handling material take-back (customer returns, stock transfers, WEEE, residual waste and recyclate) and other services. The findings are set in context with other surveys that have been undertaken to highlight the characteristics of Winchester and aid understanding in what new and novel systems might bring about a more sustainable approach to managing freight in an urban setting. A second report 'Characteristics of retail waste logistics on Winchester High Street' provides a more in-depth analysis of the specific waste generation and associated take-back mechanisms mentioned here.

2 Winchester case study area and survey methods

The businesses on Winchester High Street were chosen for the survey and at the time, Winchester City Council was gathering information to help in the development of the Town Access Plan. An understanding of how retail supply chains served this area and what their impacts and needs were would greatly aid this process and lead to a more equitable allocation of infrastructure and facilities across the main players in the city.

At the time the main data collection was undertaken (April 2008), there were 120 businesses trading on Winchester High Street, of which 83 (69%) were involved in the survey (Table 1). An interview based questionnaire was directed to 107 store managers, excluding all banks and building societies who rarely provide information on vehicle movements to their premises due to the sensitive nature of their deliveries and returns data. Each business was visited by a member of the research team to conduct the interviews which were targeted at the business manager in each case. The results from this 2008 study have been analysed and reviewed with reference to previous freight studies undertaken by the authors in Winchester and the surrounding region.

Table 1:- Businesses on Winchester High Street

Business Categories	Total no. businesses	No. Businesses surveyed	% Surveyed
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
Total	120	83	69

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

Table 2:- Business categories identified on the High Street

Business Category	Description
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 study. In order to estimate the impact of freight activity across the whole High Street, the results obtained for the sample businesses were factored up by appropriate amounts according to the total number of businesses in each business category (Table 1).

2.1 Areas of Freight Activity on the High Street

The areas where core goods delivery vehicles and service vehicles typically stopped are shown in Figure 1. These locations were determined from the responses given by the business managers and on-site observations.

2.1.1 Popular locations for handballing goods

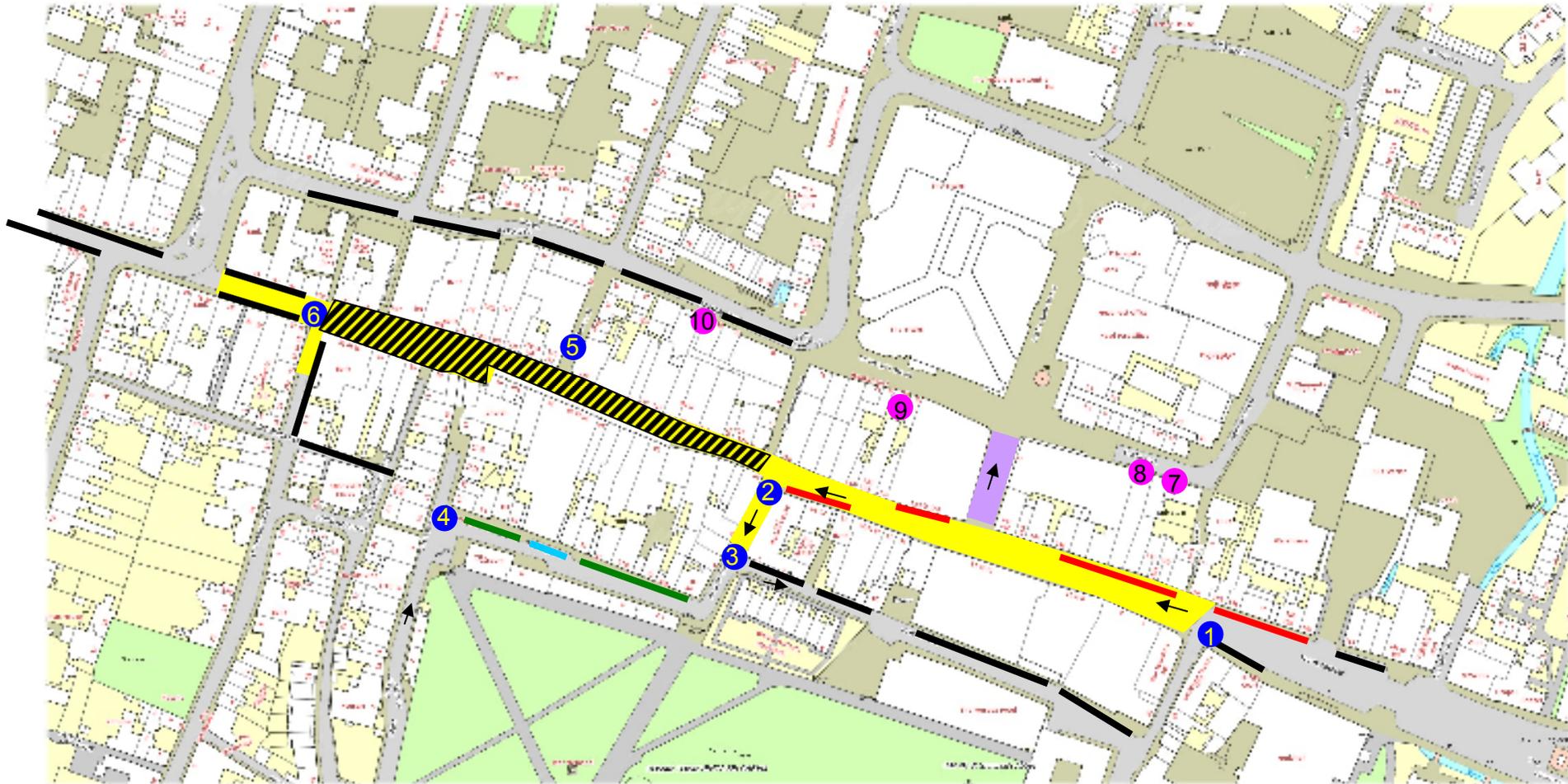
With reference to the numbers used in Figure 1 (coloured circles), the following locations are commonly used as unloading areas from where goods are handballed (typically using roll cages, trolleys) to the store.

1. Just below the 11am-3pm restricted area

This unloading area was utilised most between 11am and 3pm when the designated parking area opposite was full. Goods can be handballed to 7-15 High St. and 141-167 High St. The area has a waiting restriction in force.

2. Just below the fully pedestrianised area (entrance to Market Street)

This unloading area (Figure 2) was used to handball goods to the lower end of the pedestrian zone (25-32 High St. and 118-125 High St.) and can also be used when the designated parking around the corner on the High Street was full. This spot may only be used outside the 11am-3pm restriction and can be accessed from the High Street only, as there is a no entry sign on the Market Street approach. The distance from the no entry sign (seen in Figure 2) to the High Street is about 40m, so approximately 4 vans could unload there simultaneously.



double yellow lines;
 single yellow line;
 designated parking area;
 designated loading area

● Popular parking areas for handballing;
 ● Loading bays (dedicated to store(s));

Note: descriptions are given in the text for each numbered location

Buses only (Middle Brook St.);
 No vehs (11am-3pm);
 No vehs at any time

Figure 1:- Unloading areas used for core goods delivery and servicing

Plate removed due to file size

Figure 2:- Market Street looking towards the High St. (no access 11am-3pm)

3. Top end of Market Lane at the junction with Market Street

This unloading area (where the car is parked in Figure 3) often took the place of unloading area 2 between 11am and 3pm when access to area 2 was not permitted. The top end of Market Lane was one way (in the south easterly direction) so vehicles had to access this point from The Square. The distance from The Square to the no entry sign is about 40m and 3 or 4 vans could unload simultaneously.

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Figure 3:- Market Street looking towards the High St. (unrestricted access)

4. The Square

This unloading area (Figure 4) was used at all times of day to handball goods to 35-46 High St. and 106-115 High St. and had single yellow lines. There were spaces for around 4 vans or 2 rigid heavy goods vehicles (HGVs) to unload simultaneously.

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Figure 4:- The Square, near the passageway through to High Street

5. Parchment Street

This unloading area (Figure 5) was used at all times of day to handball goods to the same store base served by unloading area 4 (The Square), that is 35-46 High St. and 106-115 High St. This area had a waiting restriction in force and there was space for approximately 3 vans or 2 rigid HGVs to unload simultaneously. Access to Parchment Street was from St. George's Street only. The street was narrow and did not allow vehicles to pass one another so that one vehicle stopping to unload would effectively block in vehicles nearest the High Street. Movement of goods past other vehicles could also be difficult in these circumstances, particularly where waste bins added to the obstruction.

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Figure 5:- Parchment Street

6. Above the fully pedestrianised area

This unloading area (Figure 6) was used outside the 11am to 3pm period to handball goods to 45-50 High St. and 101-104 High St., within the pedestrianised zone, and to 51-56 High St. and 97-100 High St., within the 11am-3pm restricted area. This area had a waiting restriction in force.

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Figure 6:- Top end of the High Street (outside no. 99 (Travelbag))

2.1.2 Dedicated loading bays

Reference points 7 to 10 in Figure 1 indicate the locations of dedicated loading bays in Silver Hill and St. George's Street which were used by some businesses on the High Street (with the exception of (8) which was dedicated to Sainsbury's). No loading was permitted in Silver Hill between 0730-0930 and 1630-1800

7. Silver Hill (behind 149 High St.)

This loading bay was to the rear of 149 High St. (Millets) and may also have served other businesses, including The Early Learning Centre (a door at the rear of this loading bay accessed their store). The bay was also used for car parking (Figure 7).

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Figure 7:- A dedicated loading bay in Silver Hill (behind 149 High St)

2.1.3 On-street unloading (excluding dedicated loading bays)

Waiting restrictions

Figure 1 indicates some of the on-street unloading areas that had waiting restrictions (double or single yellow lines). Many local authorities allow commercial vehicles to load/unload for short periods of time (e.g. up to 20 minutes is tolerated by the City of Westminster) with the proviso that continuous loading activity must be apparent at all times, else a penalty charge notice may be applied. Such a policy is also practised in Winchester. An example is seen in Figure 8.

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Figure 8:- Unloading in a restricted area. Market Lane Winchester

Designated on-street parking bays

There were four designated parking bays (Figure 1 - red lines) which could be used by private cars (Figure 9), but there was no apparent indication of any maximum waiting time permitted.

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Figure 9:- High St. designated parking area

Designated on-street loading bays

The Square had a dedicated on-street loading area (Figure 1 - blue line) behind Boots (Figure 10).

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Figure 10:- Loading area in The Square

3 Core goods deliveries in urban centres

The most common commercial (otherwise referred to as ‘freight’) vehicle trip made into retail centres is associated with delivering ‘core goods’. The definition of ‘core goods’ is those goods that are of fundamental importance to the main commercial activity being undertaken by the business (Table 3).

Table 3. Definition of ‘core’ goods by business type.

Business Type	‘Core’ goods definition
Retail outlets	Goods sold to final customers
Warehouses	Goods delivered by suppliers for sorting and onward movement
Manufacturing premises	Goods used in the production process
Service industries	Goods essential for the day-to-day operation of the business (Travel agents, estate agents, banks, recruitment agencies, insurance brokers, hair and beauty salons)
Restaurants, pubs, hotels	Essential supplies of food, drink, laundry and other items necessary for the daily operation of the business

Definition used in the 2001 HCC Freight Survey (Cherrett et al., 2002)

There are many mechanisms by which core goods deliveries are made to businesses in an urban centre, dependent on the types of supply chains used (centralised, decentralised, hybrid), which also dictate the level and type of take-back (returns/waste logistics) that occurs using back-loading.

Quantifying the numbers and types of core goods deliveries made to a retail centre is difficult and has largely been done using establishment surveys (Allen et al., 2008). The accuracy of these very much depends on the interviewee in each case, and their level of knowledge with the supply chain networks serving their business. In terms of waste and returns back-loading which can often be dictated by the carriers and the suppliers who they serve, such activities are not the key driver of the store manager and can therefore be less well understood. Vehicle observation surveys have also been undertaken in an attempt to quantify core goods deliveries but have been found to generally underestimate the number of vehicle trips due to accuracy of sampling. Studies in Newbury, Camberley and Putney in the 1970’s (Allen et al., 2008) using both establishment and vehicle observation surveys found that the total number of core goods vehicle visits estimated by the former varied by +14%, -15% and -14% respectively.

3.1 Core goods deliveries by business type

Respondents in the Winchester study were asked to give details of the core goods delivery and service vehicles that attended their establishment during a typical week (non-peak). From the sample of respondents, there were approximately 458 core goods delivery vehicle arrivals each week (79 respondents, ranging from less than 1 per week to around 50 per week), at an average of 5.8 per business, (median across the business categories, 4.4), Table 4.

Table 4: Mean numbers of weekly core goods deliveries received by businesses on Winchester High Street

Business type	No of respondents	Average number of core goods deliveries per week	Median	Max	St.Dev
Charity shop	4	2.0	2	3	0.8
Other services	7	2.5	2	6	2
Clothing retail	13	2.8	3	7	1.8
Jewellers	6	4.5	2	17	6.3
Mobile phones	6	5.2	5	9	2.2
Pub/restaurant	4	5.5	5	9	2.6
Opticians	3	6.3	6	8	1.5
Food and drink retail	6	6.3	5.5	15	6
Footwear	3	8.3	8	13	4.5
Other retail	27	8.7	5	50	11.8

Charity shops, clothing retailers and 'other services' (including estate agents and travel agencies) received the least number of weekly core goods deliveries (less than 3 per week on average), while food and drink retailers and footwear retailers received over 7 deliveries per week on average. Four 'other retail' businesses received over 20 core deliveries per week and were all large stores with a national presence. Comparing the 2008 Winchester High Street survey findings with a study of general businesses across Winchester in 2001 (Figure 11), showed the impact different retailers can have on the mean numbers of reported core goods deliveries. Large supermarkets in the city were included in 2001 which inflated the mean number of core goods deliveries for the food retail sector category (Figure 11), the average business receiving 16.4 core goods deliveries per week (St. dev 13.1).

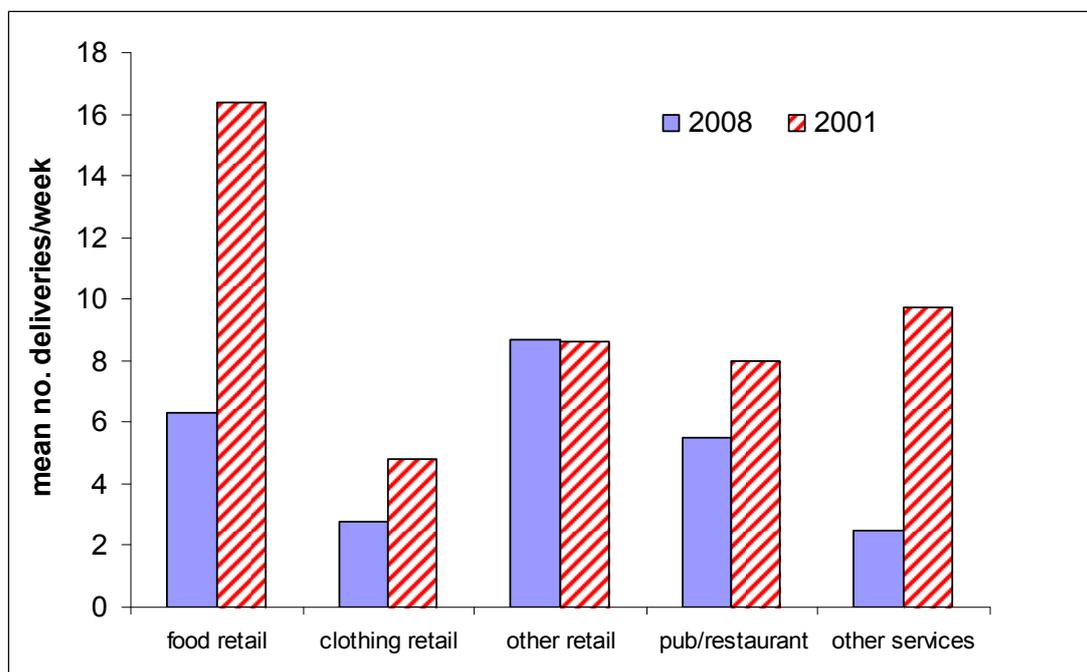


Figure 11. Average number of weekly core goods deliveries serving the businesses in Winchester (2001 and 2008 surveys). (The 2001 survey involved a sample of 137 businesses out of 404 from across the city. The 2008 survey only involved businesses on Winchester High Street only).

The 'other services' category contained 35 business respondents in 2001 from across the city whereas only 14 were present, specifically on the High Street in 2008, of which 7 supplied data on core goods deliveries. The 2001 survey also highlighted the impacts of hotels, generating 24.5 core goods deliveries per week on average, which could include linen and food, and highlighted

the difficult divide between what could be described as ‘core goods’ and ‘services’. Using the average number of weekly core goods deliveries by business type, and substituting for the non-respondents, across the 120 businesses on the High Street, 618 core goods delivery visits may be made each week (Figure 12).

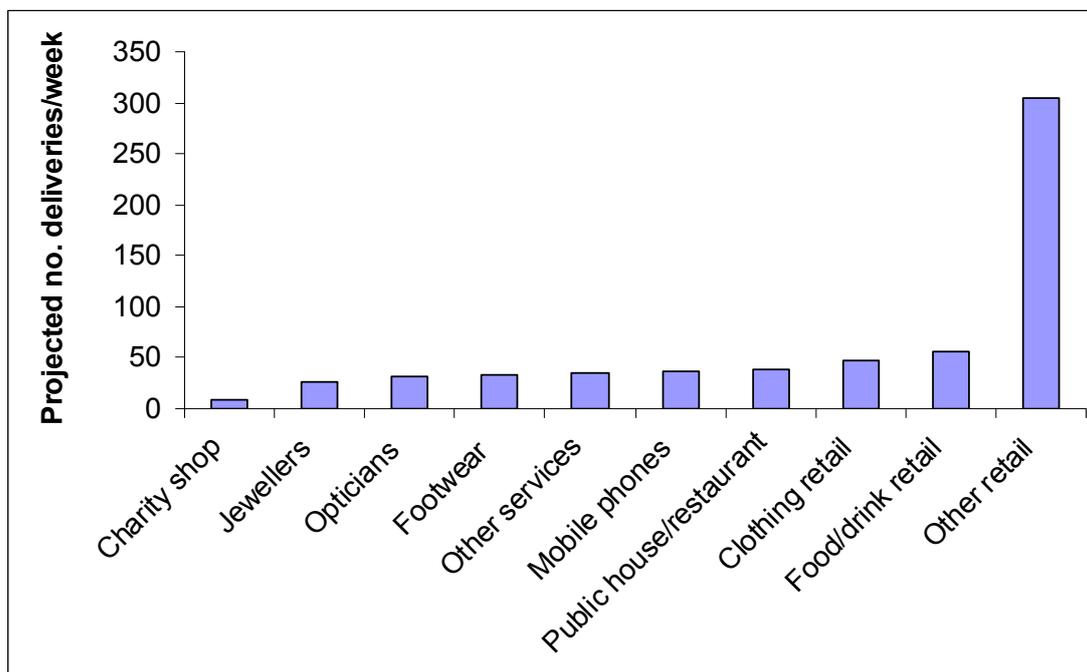


Figure 12. Total projected number of weekly core goods deliveries serving the 120 businesses on Winchester High Street

Using the +14% and -15% boundaries found in the Newbury and Camberley studies as confidence intervals, one might expect the true number of weekly core goods deliveries received by the 120 businesses on Winchester High Street to fall in the range of 704 to 525.

The numbers of core goods deliveries reported by similar studies (Allen et al., 2008) have varied depending on the question sets used in the establishment surveys. The results across 26 studies, excluding Park Royal, 2002 (focussing on large multiples) and Reading, 2002/03 (including collections as well as deliveries), and including the 2008 Winchester study, Table 5, suggest a mean of 9.2 deliveries per week to the average business (standard deviation, 5.8). Across these surveys, a variety of business categories were investigated, with a considerable amount of variability recorded within them, given the spread of small independent stores and larger national chains. The average number of deliveries can become inflated by small numbers of establishments receiving large numbers of deliveries. Looking at the median figure across these surveys suggests that 7.9 core goods deliveries might be made to the typical business on a weekly basis. This suggests that Winchester, with its large number of smaller, independent businesses is generating considerably less core goods vehicle activity per business per week compared to the average urban centre, studied previously in the UK (4.4 median weekly deliveries compared to 7.9). A key problem with making cross-survey comparisons between urban freight surveys is the different classifications of business used (Binsbergen and Visser, 1999) and the ‘UK Standards Industrial Classification of Economic Activities – SIC 2007’ business classification system should be used wherever possible.

Table 5. Goods vehicle delivery trips to urban establishments in recent UK studies (adapted from Allen et al., 2008)

Study	Year	No.	Mean	Type of survey
-------	------	-----	------	----------------

		Respondents	deliveries/ establishment/ week	
Leeds	1996	444	9.6	Establishment
Southampton	1996	172	9.7	Establishment
Winchester	1996	115	8.3	Establishment
Norwich & London	1999	34	19.6	Establishment
Covent Garden	2001	104	5.7	Establishment
Norwich	2001	21	21.6	Establishment
Winchester	2001	137	10.6	Establishment
Park Royal	2002	101	121	Establishment
Bexleyheath	2003	21	16.2	Establishment
Broadmead Bristol	2003	119	6.1	Establishment
Torbay	2003	34	24.5	Establishment
Ealing	2004	130	7.6	Observation
Colchester	2005	228	8.4	Establishment
Chichester	2005	14	6.4	Establishment
Crawley	2005	9	5.7	Establishment
Horsham	2005	14	8.9	Establishment
Worthing	2005	14	7.3	Establishment
Wallington	2005	85	13	Establishment
Catford	2006	45	12	Establishment
Croydon & Sutton	2006	183	4.9	Establishment
Bromley	2007	98	5.4	Establishment
Clapham Junction	2007		9.5	Establishment
Croydon	2007		1.8	Establishment
Kingston	2007		2	Establishment
Lewisham	2007	7	5.3	Establishment
Merton	2007		2.1	Establishment
Reading Friar St	2002/03	30	23	Establishment
Reading Market Place	2002/03	31	16	Establishment
Reading	2002/03		11	Observation
Winchester	2008	83	5.8	Establishment

3.2 Core goods deliveries by store size

To try and understand the link between the size of the retail activity and the numbers of core goods deliveries generated, an investigation of the store area (m²) was undertaken for each participating business on the High Street. Attempts have been made to also link retail activity to the number of employees or store sales turnover but these data were not made available as part of the 2008 High Street survey. One might assume that larger stores are responsible for more delivery activity based on their sales area. The size of each business, in terms of sales floor area (m²), was estimated from drawings of the High Street (extracted from EDINA mapping) and knowledge of the number of sales floors each store had through physical inspection (Figure 13). It should be noted that some of this estimated floor area may not be used for customer sales, as it could comprise stock management, staff rooms and other private areas. For the purposes of the analysis however, it was considered to be a reasonable proxy measure of the size of the business.

From the 73 businesses for which sales floor area and the number of weekly core goods deliveries were recorded, 17,616m² of total sales area generated 362 weekly core goods deliveries (2.05 deliveries per week per 100m² on average).

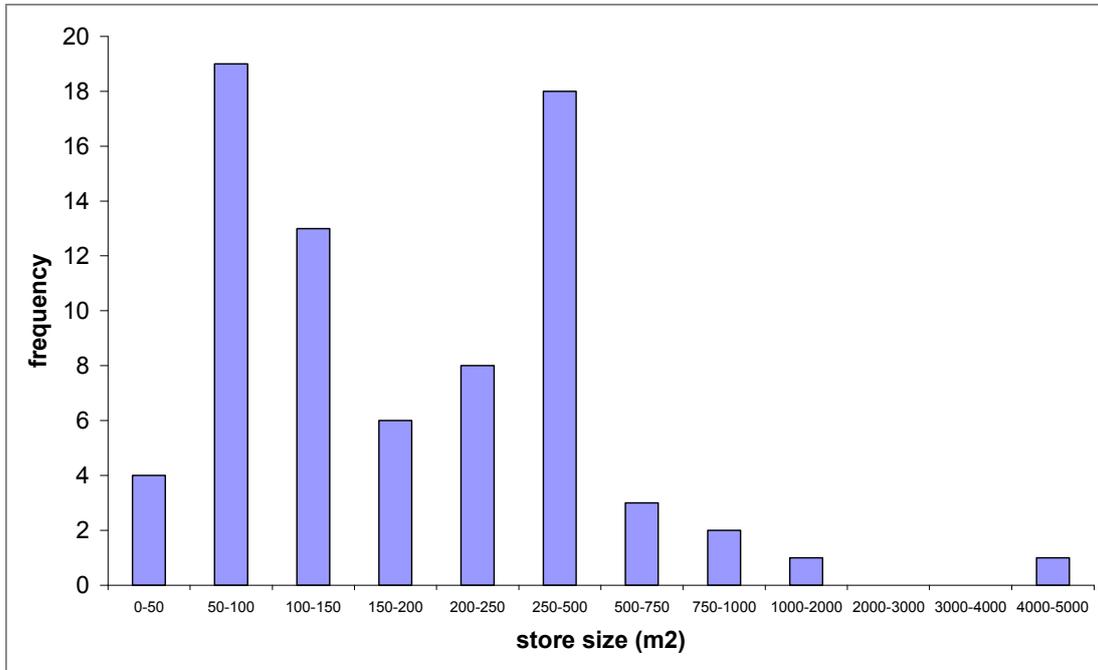


Figure 13:- Frequency plot of store size (Winchester High Street Businesses)

The results suggested that 42 businesses (56%) had sales areas under 200m² with 25 (33%) over 250m². The number of core goods deliveries per week by store size was determined (Figure 14). Across all the business categories, the results suggested that there did not appear to be a strong correlation between store size and the number of core goods deliveries received per week (0.13), a correlation close to zero suggesting that the data were independent of each other. A logical explanation would be that larger stores may tend to use larger delivery vehicles and may also consolidate loads more where they are served from a distribution centre in a centralised distribution system. Smaller stores, particularly when served through decentralised distribution systems may receive more deliveries from a range of different suppliers using smaller vehicles.

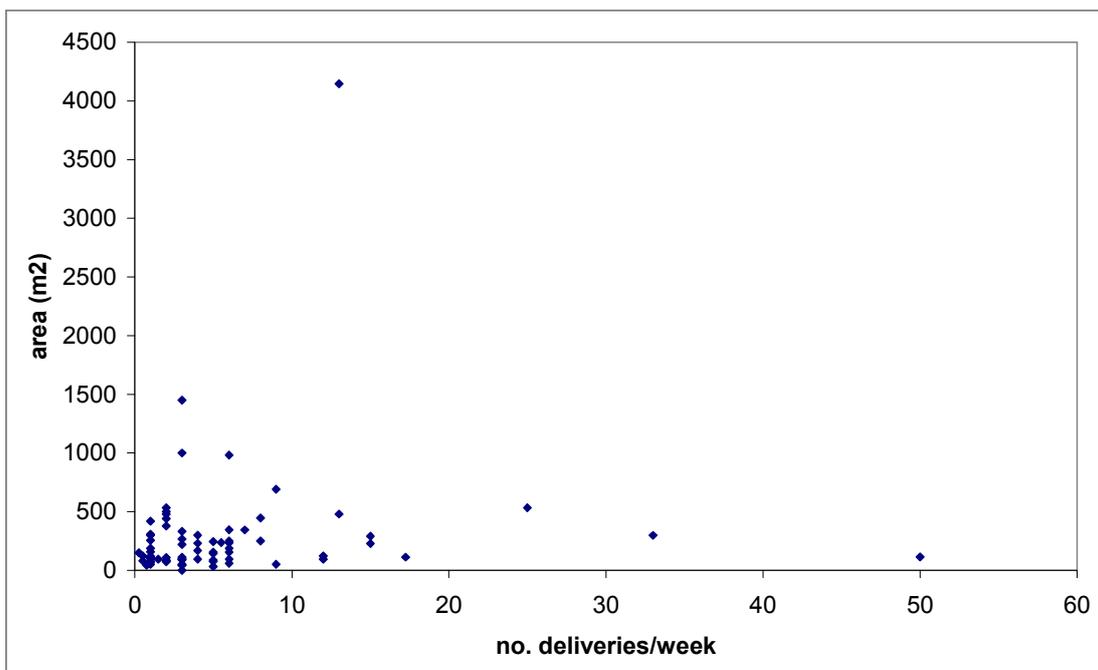


Figure 14:- No. of core goods deliveries per week received by businesses on Winchester High Street by store size (m²)

Figure 15 shows the distribution of store sizes again with three outliers removed, to provide a more detailed view of the relationship. These were:

- **A retail shipping, postal and businesses services company** – who was somewhat untypical of the general high street stores, receiving a large amount of deliveries per week (around 50) to a relatively small business, (around 114m²).
- **A retailer selling CDs, DVDs, computer games and other forms of entertainment media** - receiving 33 deliveries per week on average with a store size was estimated to be 298m².
- **A large department store** - the largest in the survey (4146m²), receiving about 13 deliveries per week using large goods vehicles.

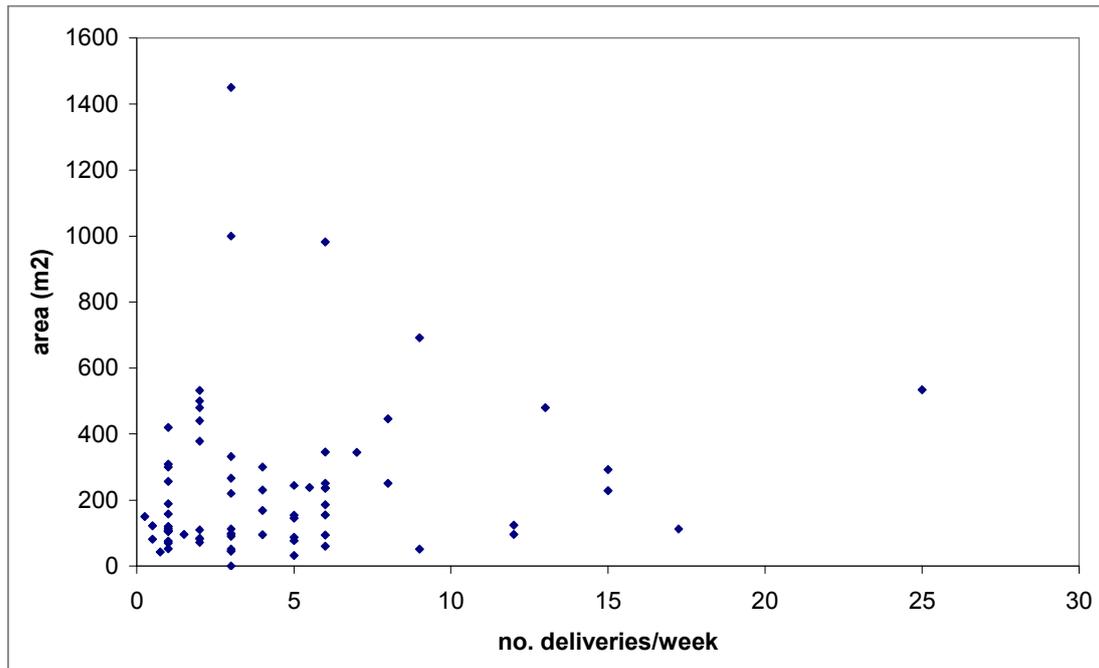


Figure 15:- No. of core goods deliveries per week received by businesses on Winchester High Street (three 'outliers' removed) by store size (m²)

When looking in more detail by business category, the results suggested that mobile phone stores and jewellers were the smallest in terms of sales area but generated the greatest number of weekly core goods movements per 100m² sales area (7.29 and 4.67 respectively), Table 6.

Table 6: Mean numbers of weekly core goods deliveries received by businesses on Winchester High Street per 100m² sales area

Business type	Mean floor area (m²)	STDEV	Mean number of core goods deliveries/week/100m²
Charity shop	90	17.6	2.22
Other services	220	153.2	1.17
Clothing retail	383	350.6	0.74
Jewellers	86	25.8	4.67
Mobile phones	77	39.6	7.29
Pub/restaurant	424	379.7	1.77
Opticians	279	150.6	2.27
Food and drink retail	124	85.8	5.64

Footwear	320	138.9	2.60
Other retail	269	253.8	2.26
<i>All businesses</i>			<i>2.05</i>

When comparing against other UK studies, looking into the relationship between store size and freight vehicle activity, the Winchester businesses generally appear to be receiving less deliveries per 100m² (Table 7). The main surveys undertaken addressing this issue took place in the early 1970's (Newbury, Camberley and Putney, summarised in Allen et al., 2008) and the raw data were not available to enable any direct statistical comparison. The individual business categories analysed also differed but the overall average number of weekly goods vehicle trips per 100m² sales area ranged between 3 and 5 across the three surveys, in comparison to 2.05 in Winchester. A simple explanation could be in the definition of 'goods vehicle trips' which may have included collections as well as deliveries. The Winchester analysis separated out these functions and service vehicle activity was analysed separately. Using 12-hour vehicle delivery rates from surveys in Wallington (2005) and Ealing (2004) suggested that the average across all shops, financial institutions and cafes/restaurants was 5.6 and 7 vehicle visits per 100m² per week.

The Winchester data do suggest that certain types of small, specialist retailer (in terms of retail sales space) could be responsible for significant freight vehicle generation on a high street. The assumption at the Local Authority level can often be that large, national chain stores, present on a high street can be associated with significant proportions of the freight vehicle activity, whether it be for core goods delivery or service provision. In a lot of cases, these types of business, serviced through centralised distribution systems, can be linked with large rigid or HGV deliveries on a scheduled basis. However, the results from Winchester suggest that smaller, specialist stores can be responsible for considerable freight vehicle activity, albeit in smaller vans and in terms of town planning, one should not assume that larger retailers (over 500m² sales area) are the most likely generators of freight delivery traffic, and should therefore get preferential treatment in terms of access/infrastructure provision.

Table 7: Mean numbers of weekly goods deliveries received by businesses in Newbury, Camberley and Putney (1973) per 100m² sales area

Business type	Mean number of goods vehicle trips/week/100m ²		
	Newbury	Camberley	Putney
Grocers/provision dealers	10.5	11.5	11.5
Other food retailers	17.4	10	7
Tobacconists/newsagents	10	18.5	5
Clothing & shoes	2.5	4.5	1.5
Household goods	9	10	1.5
Other non-food	3.5	8	4
General stores	2	2	3.5
Service trades	1.5	6	4.5
Other	3.5	1.4	2.5
<i>All businesses</i>	<i>4.5</i>	<i>5</i>	<i>3</i>

Data adapted from Allen et al., 2008

Grocers, provision dealers and food retailers recorded the greatest amount of weekly goods delivery activity in the 1970's studies and the 'food and drink' business category recorded the second highest weekly delivery rate in the Winchester survey, emphasising the contribution this retail area has on freight generation. The value of 5.6 deliveries per week per 100m² however in Winchester is half that suggested in the 1970's studies, but without detail on the question set, it is difficult to make any further inferences. Issues related to product shelf life, inventory re-order lead times, stock management processes could all explain why more frequent deliveries were made to stores in the 1970's.

3.3 Core goods deliveries by type of supply chain

The method of goods supply can also impact on the number of core goods deliveries made. Allen et al., (2000) identified three types of goods supply system from establishment studies in Norwich and London:

- **Centralised goods supply systems** (where businesses receive goods from a single point of dispatch, which could be a single main supplier or a distribution centre)
- **Decentralised goods supply systems** (where businesses receive goods from several points of dispatch which could include a variety of different suppliers)
- **Hybrid goods supply system** (where businesses can receive a significant proportion of their core goods deliveries from a centralised supply system, with others being received through decentralised networks).

The results from the 79 businesses supplying data on their main supplier/logistics provider suggested that 49% were served through a centralised system (where delivery vehicles came from a single distribution centre), with 51% being served through decentralised systems (multiple suppliers). Only 1 business claimed to operate through a hybrid system (Table 8). There were no obvious trends observed by business type, however, all businesses in the pubs/restaurants and footwear categories received deliveries through decentralised networks, perhaps highlighting the range of suppliers products sold.

Table 8:- Type of distribution system serving businesses on Winchester High Street by business category

Business type	Centralised	Decentralised	Hybrid	Unknown
Charity shop	0	2	0	2
Other services	2	4	1	1
Clothing retail	10	5	0	0
Jewellers	2	4	0	0
Mobile phones	4	2	0	0
Pub/restaurant	0	4	0	0
Opticians	1	2	0	0
Food and drink retail	4	2	0	0
Footwear	0	3	0	0
Other retail	16	12	0	0

The results also suggested that businesses using decentralised logistics systems received significantly more weekly core goods deliveries (9.1) compared to centralised stores (3.6), $T_{(39)}=3.05$, $p=0.003$, around three times the number. Similar results were found in the 1999 Norwich and London studies where decentralised served stores generated 14.2 weekly core goods deliveries on average (Median, 10) with centralised served stores receiving 4.5 (median, 2.5).

Despite the fact that stores using decentralised logistics supply systems may receive goods via many different points of dispatch (some stores recorded up to 50 different points of dispatch for core goods deliveries in the Norwich and London surveys), there is often a core logistics provider/supplier that undertakes the majority of the transport. Across the 37 decentralised stores in the Winchester High Street study, the results suggested that 1 supplier/logistics provider accounted for 68% of the vehicle activity to that business (median = 75%), SD 27. A 2 by 2 homogeneity Chi-squared test showed that there were no significant differences in the proportions of artics/rigids and vans used by businesses served by centralised and decentralised systems ($\chi^2 = 0.57$ and $\chi^2_{(0.05)}(1df) = 3.84$, Figure 16).

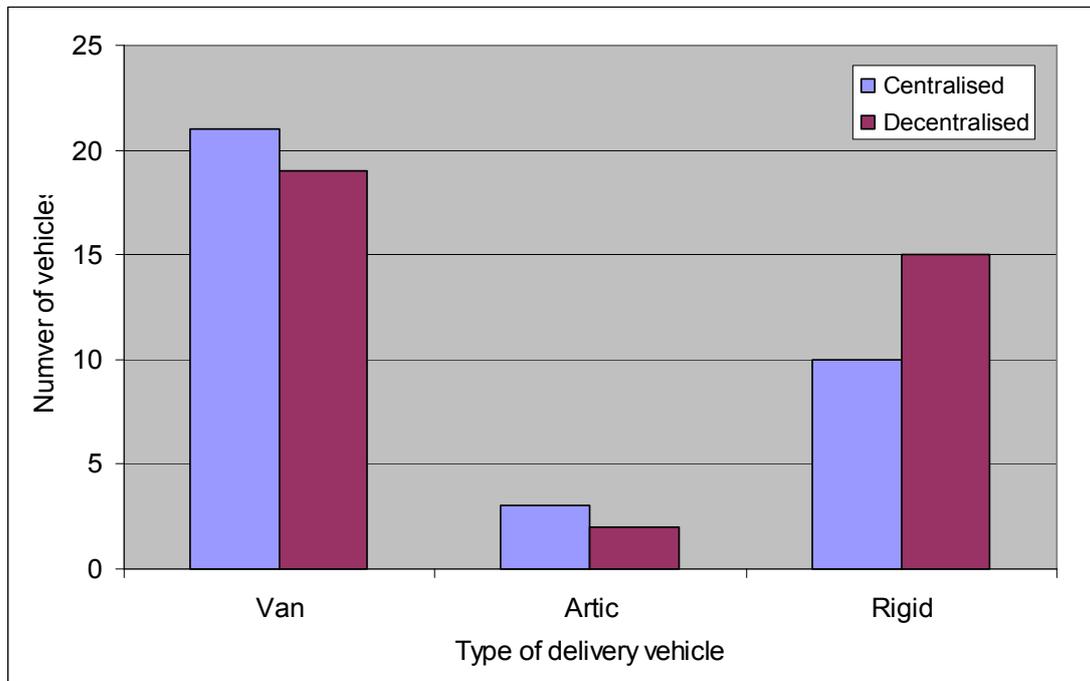


Figure 16:- Types of vehicle used by the most frequent core goods logistics provider to business in Winchester, by centralised and decentralised distribution system.

There was also no evidence of any relationship between the floor size area of the store and the type of distribution system employed. One might expect larger stores to belong to large multiples and therefore be more inclined to use centralised systems but this was not found to be the case on Winchester High Street ($T_{(42)}=0.92$, $p>0.36$)

Respondents were asked to supply information relating to their main supplier/logistics provider who made the most deliveries to their premises. While multi-drop rounds might offer a more effective method of delivery for businesses that have a number of stores situated locally, or where a supplier delivers to more than one business in an area, none of the businesses in the survey claimed that their most common supplier/logistics provider made deliveries as part of a multi-drop round. This is not to say that more infrequent deliveries are not made to these businesses by couriers operating a multi-drop system. Also, the interviewees level of knowledge regarding the detailed logistics operations supplying their business has to be questioned, particularly when a lot of these activities were organised centrally through the companies head office. Only 8% of the businesses surveyed said that they received goods on an 'on-demand' basis from their main supplier with the majority organising scheduled deliveries.

3.4 Vehicles used to make core goods deliveries

From the 83 respondents in the 2008 Winchester survey, 79 gave details of their main supplier/logistics provider which was responsible for the majority of their vehicle deliveries and 74 provided vehicle information. On average across the respondents (centralised and decentralised systems incorporated), one provider was responsible for 82% of the delivery vehicle activity to their business, equating to 3.1 deliveries out of 5.8 on average per week.

In 58% of cases, vans were used to make these deliveries with 31% being undertaken by rigid lorries (Table 9). Very few articulated vehicles were reported as being used by the primary supplier/logistics provider (4%). Forty one respondents (52%) claimed that one supplier/logistics provider was responsible for all of their deliveries equating to approximately 126 visits per week. The main logistics providers mentioned by this group of businesses are shown in Table 10.

Table 9:- Vehicle types used for delivering core goods to businesses on

Winchester High Street

Vehicle Type	LP	Provider				Total
		Courier	Business Own	Supplier	Other	
Van	23	6	10	2	2	43 (58%)
Rigid	5	2	11	5	0	23 (31%)
Artic	2	0	1	0	0	3 (4%)
Other	1	1	1	1	1	5 (7%)

Table 10. Logistics providers undertaking all the deliveries for 41 (52%) of the survey respondents

DPD UK	DHL	2020
Hays DX	Citylink	Parcel Line
Parcel Force	UPS	SMC Express
TDG	Capital Express	
TNT	Direct UK Transport	

In terms of the vehicle types used by the most frequent supplier/logistics provider to the businesses, vans still dominated (Table 11) with the smaller businesses (in terms of sales area), namely mobile phone stores, jewellers and charity shops all receiving over 65% of their most frequent deliveries by van. Rigid vehicles were most prevalent in the food and drink sectors (including retail and pubs/restaurants).

Table 11. Weekly core goods deliveries made by the main logistics provider/supplier by vehicle type for businesses on Winchester High Street (2008) (n=74).

Business Type	%Articulated	%Rigid	%Van	%Other	%Unknown
Charity shop			100		
Other services		12.5	37.5		50
Clothing retail	6.7	40	53.3		
Jewellers			66.6	33.3	
Mobile phones		16.6	83.3		
Pub/restaurant		100			
Opticians		33.3	66.6		
Food & Drink retail		50	50		
Footwear		33.3	66.6		
Other retail	14.3	39.3	46.4		

In the 2001 Winchester freight study (Cherrett et al., 2002), businesses across the city centre were asked about the total numbers of core goods deliveries they received per week by vehicle type, as opposed to just focussing on the 'main supplier/logistics provider' in the 2008 study. A Chi-Square test showed that there were significantly more rigid lorries used for making core food deliveries, and that vans were the mode of choice for the service industries (Tables 12, 13), whereas more articulated lorries were used by warehousing and manufacturing businesses. 'Other services' (estate agents, travel agents, solicitors, recruitment agents etc.) received the majority of their core deliveries by van (66% on average), as did businesses selling personal services.

Table 12. The mean number of weekly core goods deliveries by vehicle type (2001 Winchester study, n=137).

Business Type	%Articulated	%Rigid	%Van	%Car
Food retail	21	55.8	23.2	
Clothing retail	32	42	26	
Other retail	7.5	38.4	49.5	4.5
Restaurant	57.1	14.3	14.3	14.3
Public House		70	30	
Hotel		100		
Banks			100	
Other Services	5.3	21.2	65.7	7.8
Warehousing	21.8	44.9	33.3	
Manufacturing	27.2	34.3	38.5	
Personal Services		25	60	15

Table 13. The total projected number of weekly core deliveries by vehicle type by business type (2001 Winchester study, n=137).

Business Types	Articulated Lorry	Rigid Lorry	Vans	Cars	Total	χ^2
Non-food retail	86	285	265	19	655	9.5
Food retail	4	64	7	1	76	68.5
Service	19	81	267	36	403	122.6
Manufacturing/warehousing	78	124	114	0	316	52.0
Total	187	554	653	56	1450	252.6

In nine out of the twelve establishment surveys involving retailers undertaken since 2001 (Allen et al., 2008), vans ('light goods vehicles') were the dominant mode and across all the studies, were responsible for 42% of the delivery activity on average (Table 14), perhaps suggesting the influence of the major carriers on store deliveries and also the issues accessing often congested urban centres with larger delivery vehicles.

Table 14. Vehicles used for core goods deliveries across 12 urban freight surveys (2001 to 2008), Allen et al., (2008).

Study	Year	No. of business surveys undertaken	%Articulated	%Rigid	%Van	%Other
Winchester	2001	133	10	38	47	5
Reading ¹	2002-3	31	2	28	55	16
Reading ²	2002-3	51	2	28	55	16
Bexleyheath	2003	21	10	39	45	6
Bristol	2003	118	21	34	45	
Chichester	2005	14	42	39	19	
Crawley	2005	9	48	32	20	
Horsham	2005	14	29	23	48	
Worthing	2005	14	24	28	48	
Colchester	2005	244	10	26	35	30
Bromley	2007	98	29	41	27	2
Lisson Grove	2008	104	3	42	54	

In a study of 244 establishments in Colchester town centre undertaken by Steer Davies Gleave in 2005 (Allen et al., 2008), articulated lorries were most commonly used by businesses receiving over 40 deliveries per week with rigid lorries by those receiving between 21 and 40 deliveries per

week. Light vans were used to supply businesses in the town centre whilst cars were found to make up approximately 20% of the deliveries to businesses in the study. Vehicle size and weight restrictions, and the number of drops that have to be made during the day can also influence the types of vehicle used by logistics providers in urban centres (Allen et al., 2008)

3.4.1 Courier activity in Winchester City Centre

In a study of courier activity in Winchester (Cherrett & Smyth, 2003), the delivery behaviour of six courier companies was investigated (Securicor Omega Express, Lynx Express, UPS, DHL, TNT, Business Post) through a questionnaire survey of depot managers. On average across the respondents, a courier vehicle visiting Winchester would deliver packages to 48 separate businesses during a round (SD 18.1), ranging from 30 to 80. Across the 6 companies, an average courier would make 10 vehicle trips (SD 3.9) during a typical week (6 working days) to deliver packages to 413 businesses in the Winchester area. These businesses were situated in the city center (49%), Bar End (14%), Winnall (24%) and other areas around the city (12%). The results suggested that 57 vehicle trips were generated in a typical working week by the respondents making 2480 separate deliveries to businesses in Winchester (including the City Centre, Bar End, Winnall and surrounding area).

A study of courier drivers delivering to Businesses in Winchester City Centre undertaken as part of the 2008 Winchester High Street surveys suggested that larger numbers of drops were being made per round with 86 scheduled on the typical round across 5 carriers (7 driver interviews), City Link, Tuffnells, Parcel Force, DPD, DHL Express. Courier rounds involving home delivery often have very high drop rates with 120 being reported by Edwards et al., (2009). A study of an express parcels carrier as part of the Birmingham/Basingstoke/Norwich freight study (Allen et al., 2001) reported that across 41 rounds, the average number of collections/deliveries was 44. The various studies show that there is considerable variability in the numbers of drops made by couriers in urban centres on a typical round.

A heterogeneity Chi-squared analysis of the City Centre, Bar End and Winnall data from the 2003 Winchester study (Cherrett and Smyth, 2003) showed that the numbers of businesses served in each area was dependent on courier at the 99% significance level ($\chi^2 = 29.7$ and $\chi^2_{(0.01)}(10 \text{ df}) = 23.2$) with one courier (courier 1) serving significantly fewer businesses in the City Centre compared to Courier 4 (Table 15).

Table 15. Numbers of weekly courier delivery vehicle visits and businesses served in the Winchester area.

**The no. of businesses receiving a
delivery on a typical
vehicle trip by area.**

<i>(No.s of deliveries per week)</i>								
Courier Company ID	Weekly vehicle trips to Winchester for deliveries	Number of different businesses served per vehicle trip	Number of Businesses served per week	City Centre ¹	Bar End ¹	Winnall ¹	Other Areas	χ^2
2	12	40	480	17 (204)	3 (36)	15 (180)	5 (60)	4.82
4	5	80	400	50 (250)	10 (50)	10 (50)	10 (50)	7.67
9	5	55	275	30 (150)	5 (25)	15 (75)	5 (25)	1.66
6	15	35	525	20 (300)	5 (75)	10 (150)	0	0.16
1	10	30	300	6 (60)	10 (100)	10 (100)	4 (40)	13.44
5	10	50	500	20 (200)	10 (100)	10 (100)	10 (100)	1.93
TOTAL	57	290	2480	143	43	70	34	29.67
MEAN	9.5	48.3	413.3	23.8	7.2	11.7	5.7	
STDEV	3.9	18.1	106.4	14.9	3.2	2.6	3.8	

¹The number of businesses served in the City Centre, Bar End and Winnall were used in the Chi-squared analysis.

This suggests that different courier companies may have different customer bases and some rounds may well be made up of larger consignments to smaller numbers of industrial clients as opposed to small package deliveries to specialist retailers or home delivery customers.

The 2003 Winchester courier respondents were also asked how many additional vehicle deliveries would be generated during a peak business period (Figure 17). The results suggested that the run up to Christmas was the busiest period (October to December) when Courier 9 and Courier 1 would typically expect to double the numbers of delivery vehicle trips into Winchester. Across all the respondents, the average courier company would expect to make 66% more delivery trips to businesses in Winchester during this period (7 more trips per week in addition to the 10 non-peak trips usually made).

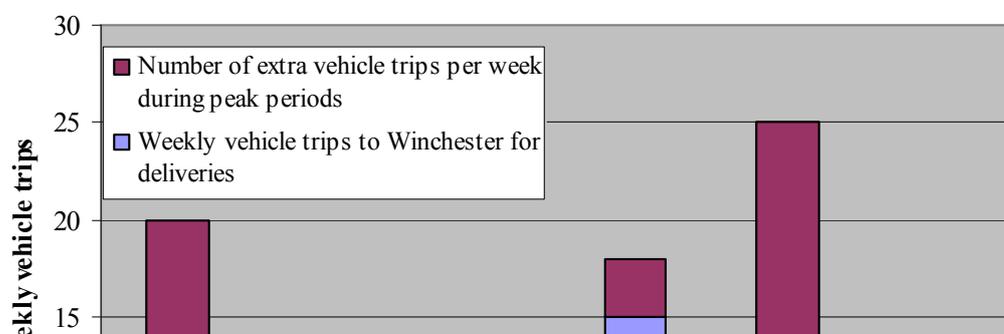


Figure 17. Number of weekly vehicle trips during pre-Christmas peak business period reported by 6 courier companies delivering to businesses in Winchester (Cherrett & Smyth, 2003)

During the Christmas peak period, the numbers of courier vehicle delivery trips could increase from 57 to 92 per week for the 6 respondents. These could generate an extra 1410 separate delivery drops to businesses in the City Centre, Bar End, Winnall and the surrounding areas. Collections also play an important part in a couriers round. From the 6 respondents in the 2003 Winchester courier activity survey, the results suggested that the 57 weekly vehicle rounds delivering packages to 2480 businesses also collected packages from 881 businesses (36%) in the Winchester area (Figure 18). Across the respondents, a courier would make 14 separate collections per vehicle round on average (SD 8.7), and 147 during a typical week (6 working days) in the Winchester area. Collections were generated by businesses in the city center (59%), Bar End (5%), Winnall (30%) and other areas around the city (6%).

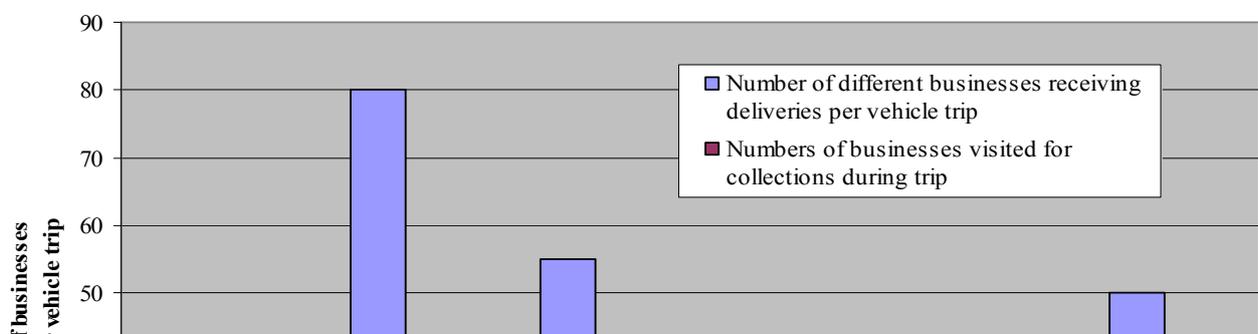


Figure 18. Numbers of businesses receiving deliveries and generating collections on a typical courier vehicle trip into Winchester reported by 6 courier companies delivering to businesses in Winchester (Cherrett & Smyth, 2003)

Although couriers would collect packages from customers at the time of delivery if packages were available and there was space in the vehicle, common practice was to make collections in the afternoon once the final delivery had been made, typically from 15:00. Because of this activity and the amount of drops that can be undertaken, it is unlikely that courier vehicles would provide a realistic option for co-ordinated product returns or recycle take-back.

3.5 Core goods delivery activity by day of the week

Before considering any opportunities for consolidating freight vehicle activity in an urban centre and possibly co-ordinating deliveries/collections, one needs to gain an understanding of the typical delivery patterns by day of the week and time interval.

Results from the 2008 and 2001 Winchester studies (Figure 19) suggest that Tuesdays and Wednesdays saw the greatest delivery vehicle activity (just over 20% of the businesses in the 2008 High Street survey received deliveries on Tuesdays), with significantly less being undertaken at the weekends ($\chi^2 = 88.02$ and $\chi^2_{(0.05)}(10df) = 18.3$, based on the 2001 data). There is still considerable variability however, and 19% of the High Street respondents stated that their deliveries were not made on fixed days and could vary from week depending on stock levels and sales.

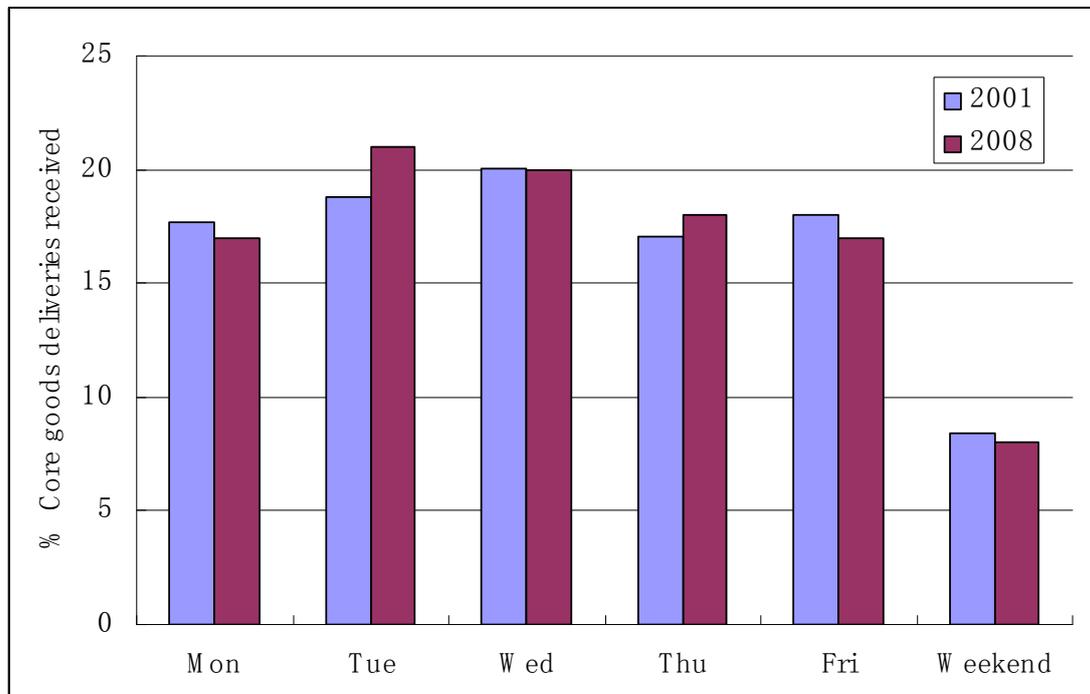


Figure 19:- Percentage of core goods deliveries received by businesses in Winchester by day of the week (2001 survey, n=137 and 2008 survey, n=83)

This is slightly at odds with the results from other urban freight studies (Allen et al., 2008) which found that Friday's generally recorded the most delivery activity (8 out of 15 studies), whilst Monday's tended to be the quietest day for freight vehicle activity. Wholesale produce markets studied in London (Western International, 2006; New Spitalfields, 2006 and Billingsgate, 2006 in Allen et al., 2008) did receive considerable vehicle activity on Saturdays demonstrating that the nature of the commercial activity very much dictates the supply chain patterns. Overall, studies have shown that the differences in the number of collections and deliveries to businesses between weekdays are relatively small and not statistically significant.

Analysis of retailer delivery days across the four towns of Chichester, Crawley, Horsham and Worthing in the West Sussex study (Cherrett and Hickford, 2005) suggested that between Monday and Friday in Chichester and Worthing, there was little difference in the number of expected core goods deliveries per business (Figure 20). In Crawley, there tended to be more deliveries during mid-week while in Horsham, the number of core goods deliveries per business was greater at the end of the week. Across all four towns, the respondent's reported receiving fewer deliveries at the weekend with 90% stating that they had regular fixed-day deliveries arranged with their suppliers.

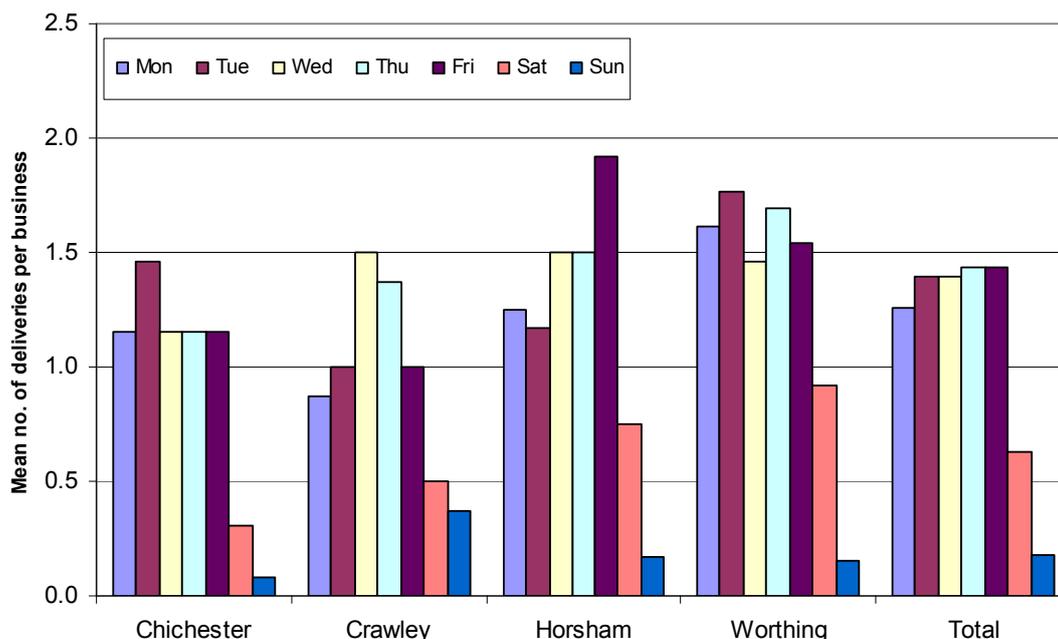


Figure 20: Mean number of core goods deliveries received per week per business in the 2005 West Sussex towns study

3.6 Core goods deliveries by time of year

In terms of peak business periods, the retail sector typically sees the greatest increase in core goods volumes from October through to December, with some seasonal variation associated with Easter and traditional sales periods, linked to certain elements of the retail sectors (e.g. clothing).

The results from the 2008 Winchester High Street study suggested that 87% of the High Street businesses considered December to be their busiest trading month with February being the quietest period (Figure 21). A similar pattern of activity can be seen when contrasting with the results from the 2001 Winchester business survey which only included 40 businesses from the High Street but a wider selection of service providers from other parts of the city.

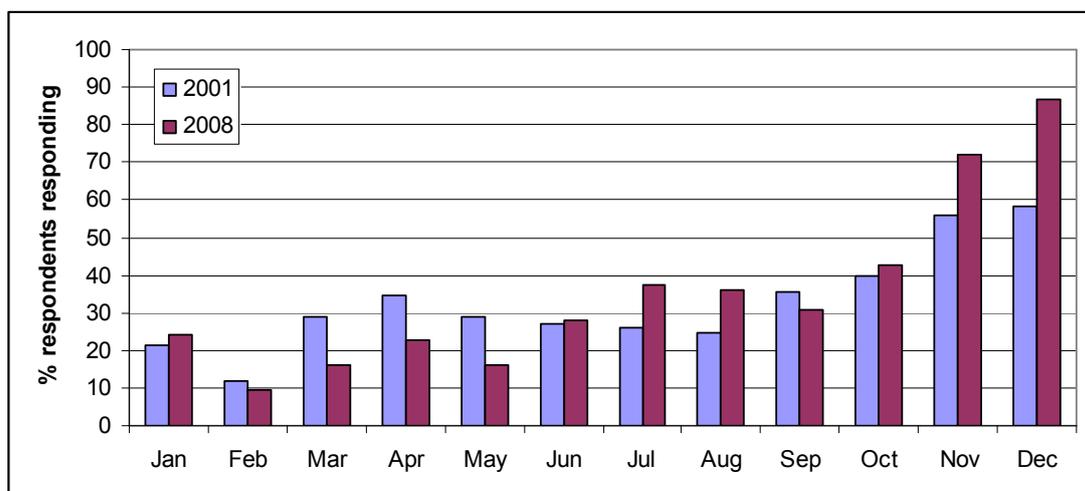


Figure 21:- Busiest trading months reported by businesses on Winchester High Street (2008 survey, n=75) and from across the city (2001 survey, n=118)

Similar peak business patterns in the run up to Christmas were noted in studies at Bexleyheath (2003), Colchester (2005) and in Chichester, Crawley, Horsham and Worthing (West Sussex, 2005), Figure 22, Allen et al.,(2008). However, studies in towns which are traditional holiday resorts can expect to experience peak freight activity during different periods of the year. A study of 34 businesses in Torbay (21%), 2003, suggested that July and August were the peak months for freight activity followed by June and December (Allen et al., 2008).

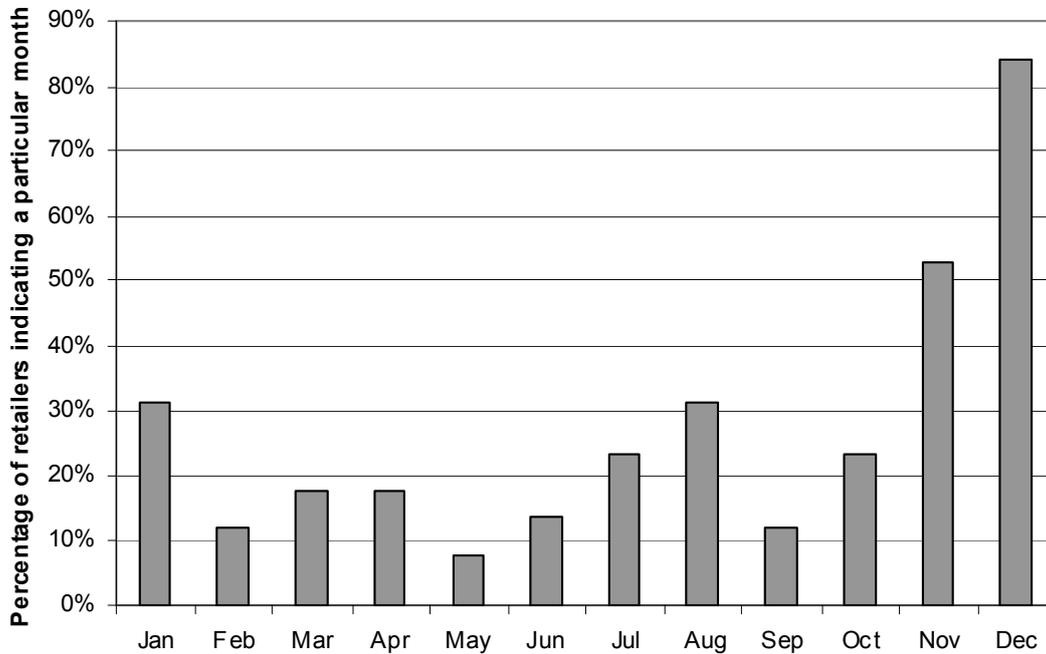


Figure 22:- Busiest trading months reported by businesses in Chichester, Crawley, Horsham and Worthing (2005 survey, n=51)

Of key interest in terms of freight planning is to what extent the numbers of deliveries per week increases during these peak periods, and how the mean size of the delivery changes. The 2001 Winchester surveys quantified the total number of weekly core goods deliveries to business across the city, and the additional deliveries that would be typically expected during the peak business periods (primarily October to December, pre-Christmas). The results (Table 16) suggested that across the 110 retail and service businesses in the survey, 25% more deliveries would be made to the average business during a peak trading week (2.4 deliveries per week in addition to 9.7). This implies that the estimate of between 525 and 704 non-peak weekly core goods deliveries made to the 120 business on Winchester High Street (Section 3.1) could increase to between 656 and 880 per week in the build up to Christmas.

A one-way Analysis of Variance (ANOVA) test showed that there were significant differences between the clothing, food, 'other retail', personal services and 'other services' business categories in the ratio of additional peak period weekly deliveries to the typical non-peak number, ($F_{(4,93)} = 2.7$, $P=0.035$, $Mse = 0.19$), with the average clothing retailer receiving 51% more deliveries during the pre-christmas period. This was in contrast to food retailers (not including pubs and restaurants) who only saw an 8% increase on average.

Table 16. Mean weekly core goods deliveries and additional peak period deliveries by business type (Winchester 2001 survey)

Business Type	n	Mean core goods del's/week	Mean extra del's/week peak	% increase in peak/week
Clothing	11	5.3	2.7	50.9
Food retail	10	18	1.5	8.3
Department stores*	3	10.7	4	37.5
Cards/gifts*	5	6.2	2.8	45.2
Jewellery*	2	2.5	1.5	60
Shoes	3	5	1	20
<i>Other Retail*</i>	45	8.9	3.6	40
Other services	26	13	2.2	16.3
Personal service	7	7.7	1	12.9
Pubs	4	5	0	0
All	110	9.7 (1066)	2.4 (268)	25.1%

From a sample of 51 business across West Sussex (Chichester, Crawley, Horsham and Worthing), the average increase in the number of core goods deliveries received during a peak trading week was 46% (Table 17) indicating the differences between towns given the mix of independent and large chain stores present.

Table 17. Increases in the numbers of weekly core deliveries between normal and peak trading periods by town (West Sussex surveys, 2005)

Town	Number of stores in sample	Number of core deliveries/week (Off-peak)	Number of core deliveries/week (Peak)	% Increase
Chichester	14	89	167	87.6
Crawley	9	51	76	49
Horsham	14	125	171	36.8
Worthing	14	102	123	20.6
Total	51	367	537	46.3

The 2001 Winchester freight study quantified the total amount of deliveries made to each store in a typical week. The 2008 study asked for details of the most frequent supplier of goods and the characteristics of their logistics operation. On average across the respondents (centralised and decentralised systems incorporated), one provider was responsible for 82% of the delivery vehicle activity to their business, equating to 3.1 deliveries out of 5.8 on average per week. The 2008 surveys found that out of the 75 businesses on the High Street who provided data on peak period volumes, 21% (across all business categories) received additional delivery vehicles whilst 57% saw increases in consignment sizes but no increases in the number of deliveries made. Only 4 businesses (5%) claimed to experience both situations.

This has highlighted that although one would expect a retailer to receive more core goods deliveries in the build up to Christmas (looking across all their supplier base), their primary goods supplier, responsible for up to 82% of their stock, may not generate additional vehicle visits during this period but may just increase the mean consignment size. A study of retailers in Broadmead Bristol (2003) attempted to gauge the quantity of stock delivered to businesses during their peak trading week (Table 18), Allen et al., (2008). Retailers expecting at least a doubling in the quantity of goods delivered were cards and gifts shops, clothing retailers, entertainment retailers, food, home furnishings and jewellery stores and toy shops. Similar findings came out of studies of retailers in Bromley and Croydon/Sutton (2007) where a 28% and 50% increase, respectively, in the quantity of consignments delivered during the peak week were reported.

Table 18. Changes in average quantity of goods delivered per vehicle in a typical and peak period week. Broadmead, Bristol (2003)

Business Type	n	Change in quantity of goods delivered (%) during peak week
Accessories	2	150
Bank/building society	1	0
Card/gift retail	6	174
Clothing	38	144
Department store	5	49
Electronics	12	32
Entertainment retail	15	248
Food outlet	50	41
Food retail	4	115
Footwear	5	81
Hairdressers	15	84
Home furnishings	11	115
Jewellery	5	309
Optician	4	25
Other	7	93
Retail others	23	88
Sports retail	4	78
Toys	3	169
Travel agent	2	71
Total	212	
Average		91%

3.7 Core goods deliveries by time of day

Studies of freight delivery in urban centres suggest that the 06:00 to 12:00 period generates the most activity but many businesses appear to receive deliveries and collections throughout the working day (Allen et al., 2008). Across 11 freight surveys, specifically addressing the delivery times of goods vehicles to premises, (Norwich and London, 1999; Norwich, 2001; Bexleyheath, 2003; Broadmead Bristol, 2003; Chichester, 2005; Colchester, 2005; Crawley, 2005; Horsham, 2005; Worthing, 2005; Bromley, 2007; Croydon and Sutton, 2007), 49% of the 2178 delivery times related to a morning delivery before 12:00.

Retailers appear to have a preference for morning deliveries, beginning the working day by unpacking and sorting stock while the premises are relatively quiet. Work by Allen et al., (2000) also suggested that a sizeable amount of delivery activity takes place during the morning peak period, often adding to congestion problems caused by commuter traffic. The 2008 Winchester High Street survey suggested that 43% of the core goods deliveries made by the businesses most common logistics provider/supplier occurred between 04:00 and 12:00 with 28% stating that they had no fixed delivery time with their main provider (Table 19). There were no significant differences observed between the delivery times of stores who were served through centralised and decentralised logistics systems.

Table 19. Reported delivery times of core goods made by the businesses most common logistics provider/supplier in the 2008 Winchester High Street survey.

Delivery window	Decentralised	Centralised	Total
------------------------	----------------------	--------------------	--------------

04:00-06:00	2 (5.3%)	2 (5.4%)	4 (5.3%)
06:00-09:00	3 (7.9%)	4 (10.8%)	7 (9.3%)
09:00-12:00	9 (23.7%)	12 (32.4%)	21 (28%)
09:00-16:00	3 (7.9%)	0	3 (4%)
12:00-17:00	1 (2.6%)	3 (8.1%)	4 (5.3%)
16:00-18:00	0	1 (2.7%)	1 (1.3%)
No fixed time	11 (28.9%)	10 (27%)	21 (28%)
Other	9 (23.7%)	5 (13.5%)	14 (18.7%)
(Total responses)	38	37	75

The business managers in the 2008 study were also asked to state the times of day when they typically received deliveries from up to five of their other main suppliers (Table 20) and 128 examples were provided. The results suggested that at least 13% of deliveries were made before 9a.m. with 33% being made between 0900-1200 with relatively little delivery activity taking place in the afternoon.

Table 20. Reported delivery times of core goods made by the businesses top 5 logistics providers/suppliers in the 2008 Winchester High Street survey.

Delivery window	Frequency	Percentage
0400-0600	5	4%
0600-0900	12	9%
0900-1200	42	33%
0900-1600	6	5%
1200-1700	6	5%
1600-1800	1	1%
No fixed time	33	26%
Other	23	18%
Total	128	100%

There were no significant differences found between the individual business categories in terms of the delivery time of the most common logistics provider/supplier. Research undertaken by McKinnon (1999) suggested that food retailers receive the majority of their deliveries between 05:00 and 09:00. The influence suppliers and carriers have on the transport decision was evident by the fact that 26% of businesses did not have a set delivery time arranged and the goods could arrive at any time during the working day. The Covent Garden study (Tyler, 2001) suggested that only 40% of the respondents (mainly small independent retailers) had any control over delivery times which was a feeling echoed in Colchester (Steer Davies Gleave, 2005) where only 31% felt they had any control.

The results largely echoed those found in the 2001 study which covered businesses across the city and found that the majority of deliveries took place between 09:00 and 16:00 with the second biggest window being between 06:00 and 09:00 (Figure 23). It should be noted that the periods of analysis were slightly different with no 09:00 to 12:00 period being studied. Most of the central area of Winchester operated a 'no-waiting' policy during the peak periods (07:30 to 09:30 and 16:30 to 18:00), Monday to Saturday, and night time deliveries were not reported by any of the Winnall or High Street respondents.

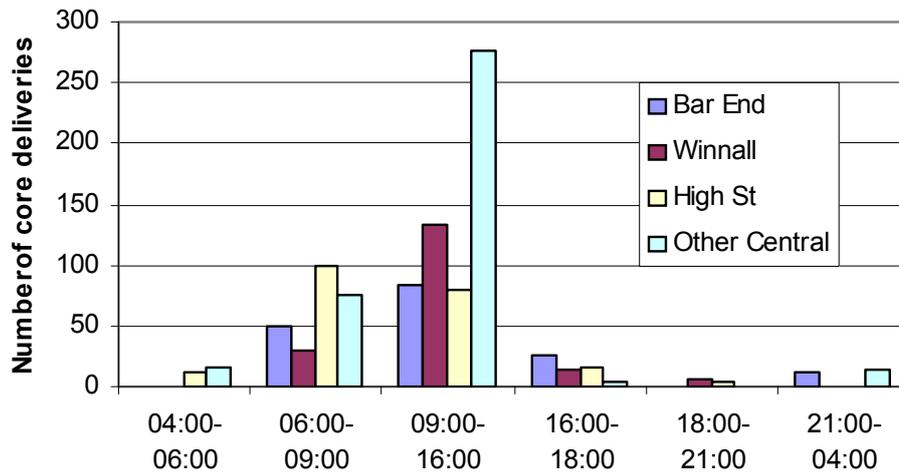


Figure 23. Reported delivery times of core goods by area in the 2001 Winchester Freight Study

The 2005 West Sussex towns study (Cherrett and Hickford, 2005) suggested that the majority of deliveries took place outside the peak traffic periods between 06:00 and 09:00, with the second biggest delivery window being between 09:00 and 16:00, typically in the mid-afternoon (Figure 24). This was the case in all locations with the exception of Horsham, where slightly more deliveries were received by the respondents between 09:00 and 16:00 than during the earlier time period. Fewer respondents from Horsham indicated that there were any loading restrictions outside their premises compared to the other towns, and this may have accounted for the greater amount of deliveries during business trading hours. Eight businesses across the whole West Sussex sample (16%) stated that they had no fixed delivery times.

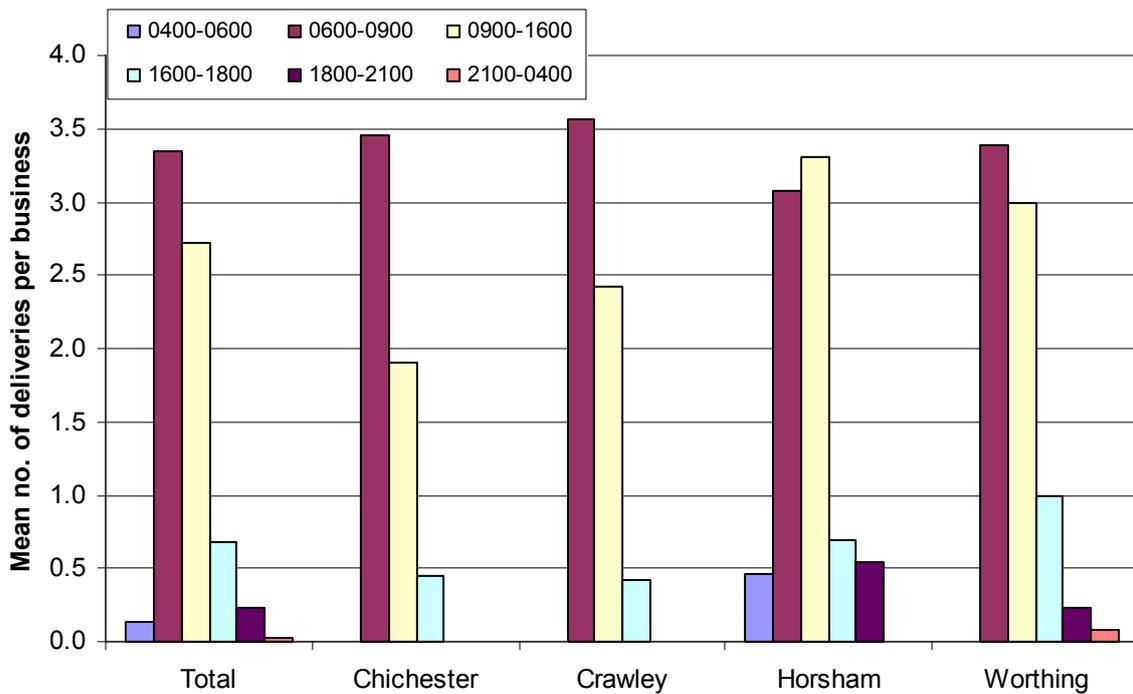


Figure 24. Reported delivery times of core goods by town in the 2005 West Sussex Freight Study

3.8 Unloading times of core goods delivery vehicles

A detailed understanding of freight vehicle dwell times, delivering to businesses in the High Street is important if any type of co-ordinated delivery and service plan is to be drawn up as part of the future Town Access Plan. A knowledge of how freight uses the current delivery bays and the extent of on-street deliveries, which may contravene the current waiting policy is essential in order to better plan for delivery and service vehicle provision in the future. Systems encouraging shorter dwell times should be encouraged to help reduce traffic delays and the environmental impacts of freight. Allen et al., (2000) identified that dwell times can be influenced by:

- The distance from the goods vehicle to the premises
- The location at which the vehicle parks (off-street v on-street)
- The size of the delivery
- The weight of the goods
- The type of product
- Whether or not the goods are unitised
- The means of getting goods off the goods vehicle
- The means of conveying the goods from the vehicle to the premises
- Whether the driver has to close and lock the vehicle
- The number of people performing the delivery
- Whether staff at the receiving establishment assist with loading/unloading
- Whether or not the goods have been pre-ordered by the establishment or not (i.e. van sales)
- Whether or not goods have been sorted for delivery prior to the vehicle's dispatch from the warehouse
- The extent to which the receiver checks the goods
- Whether or not staff at the receiving establishment need to be present at the time of delivery
- Whether or not the driver requires a signature for delivery
- Whether or not other deliveries/collections are taking place at the receiving establishment

at the same time

Average unloading times for different vehicle types and for different providers were estimated based on the business managers responses regarding their most common logistics provider/supplier (Table 21). The mid-point of each category was assumed in calculating these averages (e.g. '1-15 minutes' was assumed to be 7.5 mins).

Table 21:- Average unloading times (mins) for vehicles delivering core goods to businesses on Winchester High Street

Vehicle Type	Provider				
	Logistics Provider	Courier	Business Own	Supplier	Other
Van	9	8	23	8	30
Rigid	8	15	24	23	
Artic	56		23		
Other		8			8

The results suggested that across the 58% of businesses on the High Street receiving vans from their most common provider, the mean dwell times of vehicles unloading core goods was not significantly quicker (16 minutes) compared to the 31% using rigid lorries (18 minutes), $T_{(41)}=1.96$, $p=0.056$. The 2001 Winchester study drew a larger sample of businesses from across Winchester and asked for mean dwell times across all types of vehicle received at the premises. A one-way Analysis of Variance (ANOVA) test showed that there were significant differences between the mean dwell times of articulated vehicles, rigid and vans ($F_{(2,190)} = 20.9$, $P<0.001$, $Mse = 0.89$), taken from businesses across four areas of the city (the city centre, the High Street, Winnall and Bar End), Figure 25. Articulated lorries recorded the longest dwell times, (36 minutes) with rigid (19 minutes), vans (9 minutes) and cars (8 minutes). These figures are in line with other urban freight surveys (Table 22) which have suggested that on average, mean dwell times for HGV's making deliveries are 31 minutes, rigid, 19 minutes, vans, 10 minutes and cars, 8 minutes.

It should be remembered that these estimates of delivery vehicle dwell time based on 'establishment surveys' can be crude, as they are often based on the perceptions of business managers who may not be fully aware of the time taken to unload the vehicle, particularly when this activity can often be undertaken away from the store.

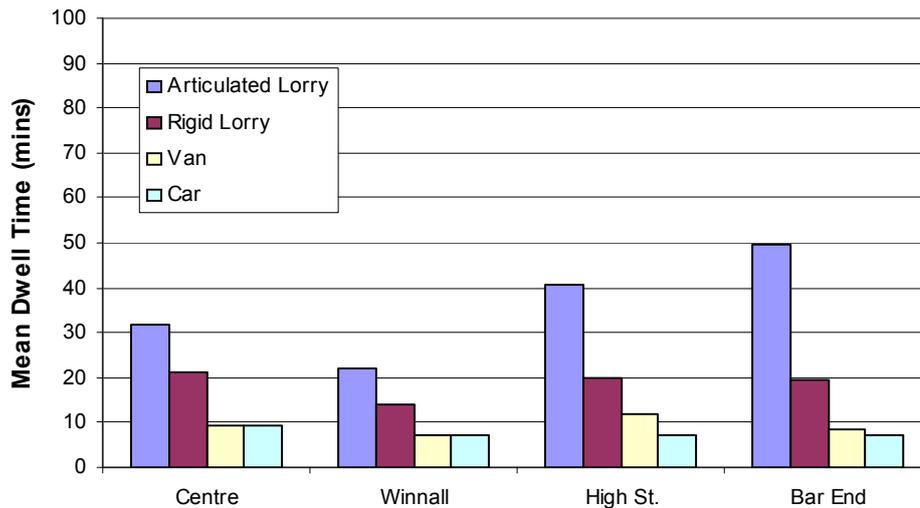


Figure 25:- Mean dwell time (minutes) by delivery vehicle type by area (Winchester 2001 study)

Table 22:- Mean dwell times for loading/unloading in recent UK studies by vehicle type (minutes). From Allen et al., (2008)

Study	Year	Type ²	HGV	Rigid	Van	Car
Bar End ¹	2001	Est	50	20	8	7
Winnall ¹	2001	Est	21	13	7	7
City ¹	2001	Est	31	21	9	9
High St ¹	2001	Est	41	20	12	7
Reading	2002	Est	11	11	9	6
Bexleyheath	2003	Est	22	22	7	6
Bexleyheath	2003	Est	26	26	19	15
Ealing	2004	Obs	16	14	19	8
Chichester	2005	Est	42	33	11	
Crawley	2005	Est	48	14	7	
Horsham	2005	Est	33	18	7	
Worthing	2005	Est	38	33	7	
Wallington	2005	Obs	21	7	7	
Mean			31	19	10	8

¹Surveys undertaken in Winchester by Cherrett et al., (2002)

²Type of survey undertaken (Est; Establishment survey, Obs; Observation survey)

From the 2005 West Sussex freight surveys (Cherrett and Hickford, 2005), the 14 respondents from Chichester, Horsham and Worthing generated an estimated 45.6, 33.9 and 39 hours of delivery time per week respectively (Figure 26, 27). This equated to a mean delivery time across each sample of 3 hours, 30 minutes; 2 hours, 34 minutes and 2 hours, 44 minutes respectively for the average respondent from each of the three towns, given the mix of vehicles received and mean number of deliveries per week. The 9 respondents from Crawley generated 27.3 hours of delivery time per week, averaging at 2 hours 45 minutes total delivery time for a retailer receiving 5.7 deliveries in a typical week (29 minutes per delivery).

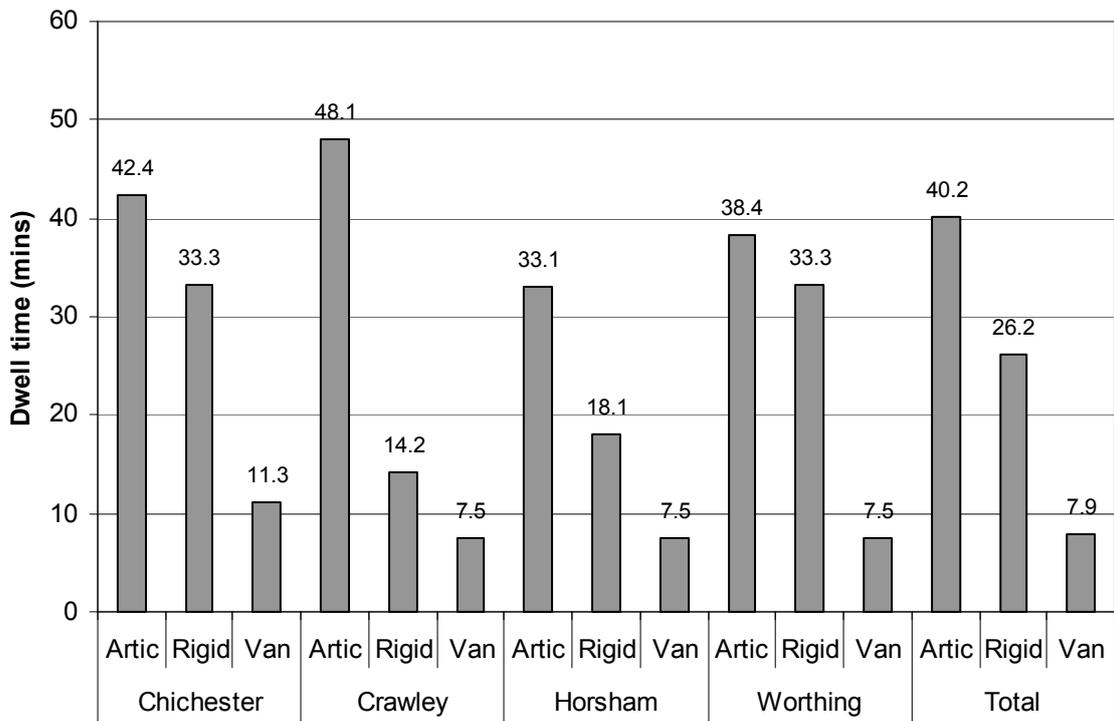


Figure 26:- Mean dwell time (minutes) by delivery vehicle type by town in the 2005 West Sussex freight surveys (Cherrett and Hickford, 2005)

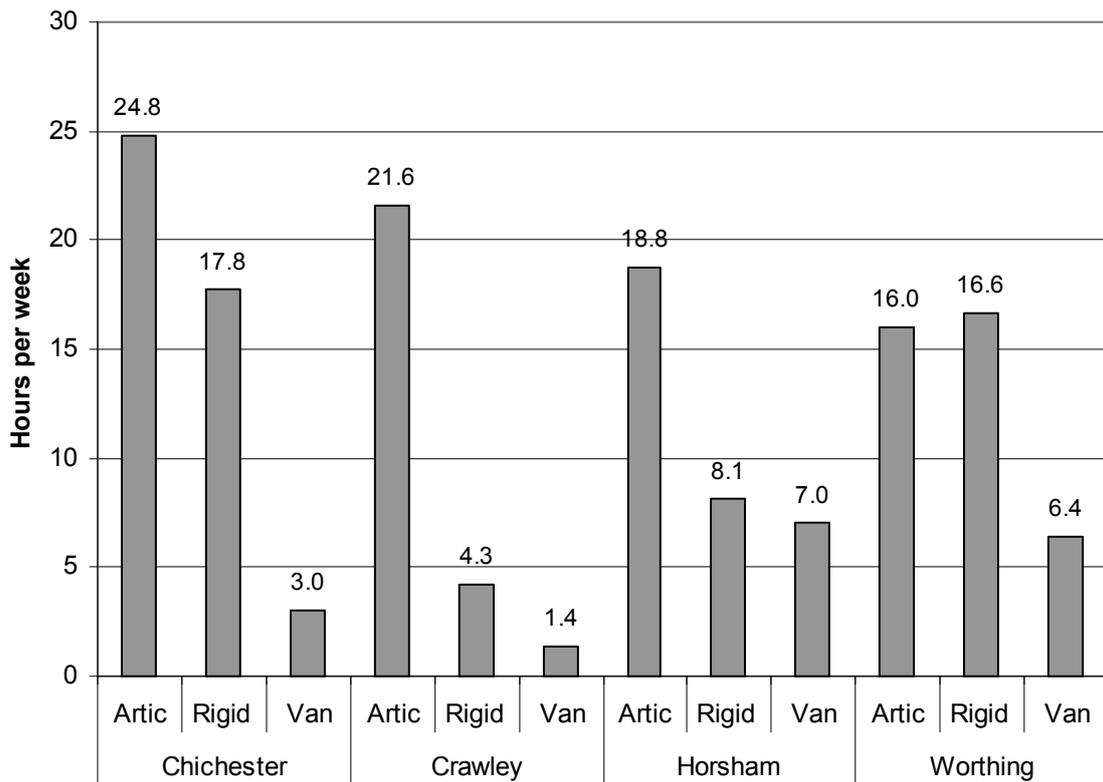


Figure 27: Total weekly dwell time for respondents by town in the 2005 West Sussex freight surveys (Cherrett and Hickford, 2005)

Logistics providers and couriers recorded the shortest mean van dwell times of 9 minutes and 8 minutes respectively. Where vehicles are owned by the business concerned, the dwell times were

found to be considerably more (over 20 minutes) suggesting that deliveries might involve multiple consignments or be more complex owing to the nature of the goods or the activity of the vehicle whilst at the premises. Across all the business categories, the results suggested that there did not appear to be a strong correlation between store size and the mean dwell time of core goods delivery vehicles (0.12), a correlation close to zero suggesting that the data were independent of each other. One might expect larger stores to receive greater volumes of goods in the typical delivery and therefore have a greater mean dwell time but this was not found to be the case.

The results also suggested that across the High Street, businesses receiving goods via their most common provider, the mean dwell times of vehicles coming from decentralised distribution systems were not significantly quicker (14.5 minutes) compared to those from centralised systems (16.9 minutes), $T_{(71)}=0.76$, $p=0.45$. One might expect vehicles in centralised systems to be more involved in material take-back to the distribution centre (either product returns, stock returns, recycle return or a combination) and would therefore record a longer mean dwell time compared to vehicles operating through a decentralised system which may operate on multi-drop rounds.

Average unloading times for the different business types were estimated (Figure 28), based on the data provided by the businesses related to their most frequent supplier/logistics provider (2008 Winchester High Street study). The longest dwell times were associated with charity shops (26.3 mins), food and drink retail (22.5 mins) and for 'other retail' (20.5 mins) with an overall average across all business types of 16 minutes. The dwell times recorded in the 2001 Winchester study related to the overall mean across all core goods deliveries received by the business (not just the main supplier/logistics provider) with an overall mean dwell time of 20 minutes. In the case of clothing retail, the main supplier/logistics provider, (although accounting for up to 82% of the vehicle activity to that business in some cases) was not always the main contributor to dwell time, and other, more infrequent suppliers would spend longer at the kerbside.

Jewellers, mobile phone retailers and opticians recorded the quickest dwell times with delivery vehicles from the main supplier/logistics provider all taking under 10 minutes on average. This perhaps highlights the impact of smaller consignment sizes and the influence of the couriers in these particular supply chains.

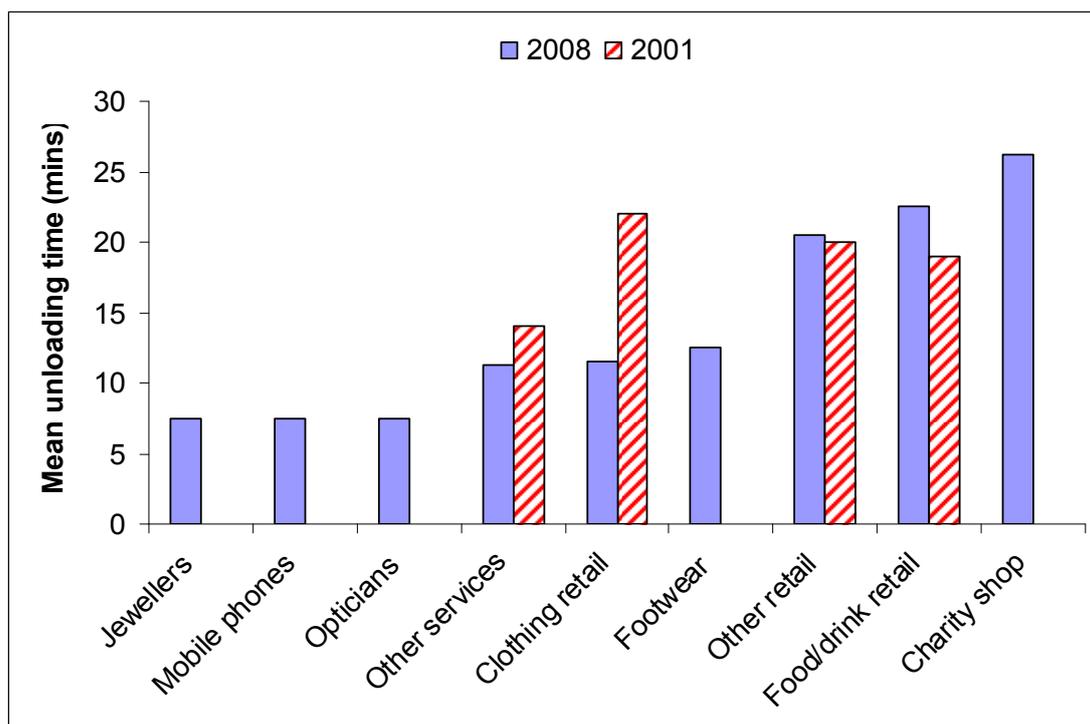


Figure 28. Average unloading times of the main supplier/logistics providers delivery vehicle by business type (minutes) reported by business managers on Winchester High Street (blue bars, 2008 survey; red/white bars, 2001 survey)

The total projected unloading time associated with supplying core goods to the businesses on Winchester High Street was estimated, based on the mean dwell times estimated for each business category (Figure 28) and the projected number of core goods deliveries received per week (Figure 12, Table 4). The results (Table 23) suggested that approximately 173 hours of delivery activity could take place serving the 120 businesses on the High Street each week (1 hour 27 minutes per business per week). Taking a 5-day week, this could equate to 17 minutes of delivery dwell time per business each week day, of which 73% (13 minutes) could occur on-street. From the High Street Respondents, 63% of the vehicles used by the primary logistics provider/supplier were vans, suggesting that approximately 109 hours could involve this specific mode alone.

Taking the average figure of 42% van activity across all road-based deliveries from 12 urban freight studies undertaken since 2001, Table 14 (Allen et al., 2008), 73 hours of van deliveries might be experienced per week across the High Street retailers (37 minutes per week per business or 7.4 minutes per day).

Table 23:- Total estimated unloading time associated with the weekly core goods deliveries made to the 120 businesses on Winchester High Street

Business Type	Projected core deliveries/ week	Mean dwell time of main supplier/logistics provider (mins)	Potential total weekly dwell time mins (hrs)
Charity shops	8	26.3	210 (3.5)
Clothing retail	48	11.5	552 (9.2)
Food/drink retail	57	22.5	1283 (21.4)
Footwear	33	12.5	413 (6.9)
Jewellers	27	7.5	203 (3.4)
Mobile phones	36	7.5	270 (4.5)
Opticians	32	7.5	240 (4)
Other retail	305	20.5	6253 (104)
Other services	35	11.3	396 (6.6)
Public house/restaurant	39	15 (from 2001)	585 (9.8)
Overall	618	16 (mean)	10405 (173hrs)

3.9 Unloading locations for core goods deliveries

The High Street respondents in the 2008 surveys were asked to give details of where the main supplier/logistics provider's delivery vehicle parked to make deliveries. Across the sample, 70 business managers gave details of the position of the delivery vehicle relative to the store with 73% stating that unloading took place on-street, the majority being undertaken on public roads (Figure 1). The 2001 survey received 39 responses from businesses on the High Street who reported that 82% of their total weekly delivery traffic was unloaded on the public road (61% directly outside the business entrance). Only 14 of the businesses surveyed in 2008 (20%) claimed that the main supplier/logistics provider's delivery vehicle used a loading bay either at the rear of the store or elsewhere. The dominance of on-street unloading implies that there could be approximately 126 hours of stationary delivery vehicle activity per week serving the High Street businesses (21 hours per day assuming a 6 day delivery week).

In a study of courier activity in Winchester (Cherrett and Smyth, 2003), the delivery behaviour of six courier companies was investigated (Securicor Omega Express, Lynx Express, UPS, DHL, TNT, Business Post). The results suggested that 48% of deliveries/collections took place with the delivery vehicle parked outside the customer's premises on the public road. Given that the average courier vehicle delivered to 143 city center businesses in a typical non-peak week, 69 of these might involve the vehicle parking on the public road. This implies that courier's often have to park in restricted areas in order to make deliveries and collections. There was some variation noted between the respondents. Both Couriers 2 and 5 (Figure 29) stated that 50% and 60% of their vehicles managed to park on a customer's premises (off the public road) whilst making deliveries/collections. None of the respondents reported using a pay-and-display car park to make deliveries or collections.

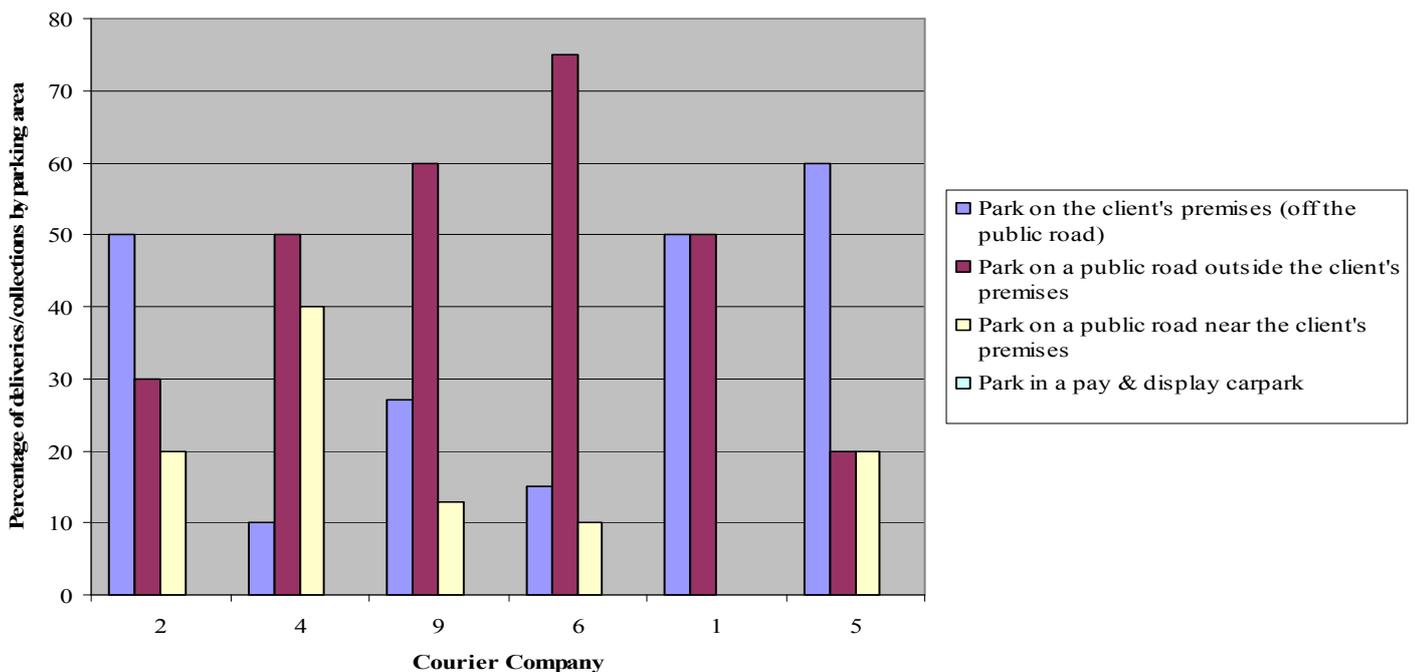


Figure 29. Areas where courier vehicles parked while deliveries/collections to businesses in Winchester City Centre were taking place (Cherrett and Smyth, 2003)

3.10 Consignment sizes and packaging types

In order to assess the potential suitability of delivery vehicles for handling material ‘take-back’, it is important to understand the nature of the core goods being delivered and the types of containment system used to handle the goods. Surveys in Bromley (2007), Croydon/Sutton (2006), Reading (2003), reported in Allen et al., (2008) and Winchester (2003), reported in Cherrett and Smyth (2003) showed that there were specific packaging types used to contain goods delivered to retailers:

- Loose cardboard boxes
- Crates
- Totes/bins/dollies (typically plastic)
- Pallets
- Roll cages
- Hanging rails
- Kegs

As a result, some types of goods might require specialist vehicles or specialist in-vehicle equipment to enable loading and unloading to take place which may limit their suitability for backloading. Surveys of 531 deliveries to businesses in Bromley and to 183 establishments in Croydon and Sutton (Allen et al., 2008) suggested that ‘loose boxes’ made up 68% and 56% of the delivery activity to retailers respectively. Similar findings were made in the 2008 Winchester Business Managers survey when 58% of the respondents (n=71) stated that the typical delivery from their main supplier/logistics provider was made up of loose boxes. Across these three studies, 20% (Bromley), 25% (Croydon and Sutton) and 32% (Winchester) of deliveries involved a mixture of two or more items (boxes, crates, totes, dollies, roll cages, hanging rails, pallets). Little use of roll cages were reported however across the studies (4%, 1% and 1%), implying that these may be used primarily by the larger multiples operating single drop deliveries served through centralised distribution systems.

For the purposes of planning the optimal sizes of unattended locker banks to handle out-of-hours deliveries into Winchester, Cherrett and Smyth (2003) attempted to quantify the average consignment size received by businesses in city centre, received from their main supplier. Boxed goods were separated into three size categories:

1. ‘Small’ - Shoe box size or smaller (12 cm high by 32 cm wide by 24 cm deep)
2. ‘Medium’ - Between shoebox size and a 21 inch television (52 by 55 by 52)
3. ‘Large’ - (assumed to be twice a ‘medium’ package).

Considerable variability was noted between the respondents (n=72) in each business category in terms of the size of boxes received. This might be expected given the difference in size and turnover of the various businesses in the sample. Three respondents from the ‘Other Retail’ category claimed that in a typical delivery from their main supplier they would expect to receive 100, 150 and 200 medium sized packages respectively. Overall, the results suggested that the average business might receive 9 small, 17 medium and 10 large boxes in a typical delivery from its main supplier and this would occur 3 days per week (Table 24).

Table 24. Characteristics of the typical delivery provided by the main supplier (package sizes are in centimetres), from the 2003 Winchester survey (Cherrett & Smyth, 2003).

Box sizes (cm)		
Small	Medium	Large

	(12*32*24)	(52*55*52)	(>52*55*52)
No. business receiving these boxes	21	49	28
Mean No. boxes received by each business in a typical delivery	9.4	17.2	10
Min	1	1	1
Max	50	200	50
STDEV	9.38	38.86	11.81
% Delivered by hand	62.5	79.6	50
% Delivered by pallet	20.8	16.3	31.3
% Delivered by roll cage	16.7	2	12.5
% Delivered by 'other' means	0	2	6.3

The business managers were also asked how the boxed goods were delivered to their premises from the vehicle. Across all box sizes, the driver and/or the business staff would expect to handball the packages from the vehicle in over 50% of cases. Surprisingly, 50% of the large packages were carried into the premises rather than using a wheeled pallet truck or a roll cage. Roll cages did not feature heavily as a means for transporting goods from vehicle to premises and is perhaps further evidence that this mode of package consolidation is usually associated with larger stores who receive many different product lines in a single delivery. Eight of the respondents (11%) received garment racks from their main supplier in addition to boxed products. Seven of these respondents came from the Clothing Retail business group who received 2.4 garment racks on the average delivery. The 74 respondents in the 2003 Winchester survey were asked whether a member of staff had to be present when a delivery from their main supplier was taking place. The results showed that 89% always had their staff available to receive a delivery.

3.11 Backloading practices

Back-loading specifically refers to the use of delivery vehicles to take back items to the distribution centre, depot, supplier/manufacturer as part of the delivery round, with the aim of increasing vehicle utilisation and improving transport efficiency. Looking specifically at the back-loading adopted by the main supplier/logistics provider described by each respondent, 41% of businesses stated that they did not utilise any back-loading capability. Of the 7 businesses who received goods 'on demand', 5 did not use back-loading to returns goods. Three of these were jewellers, who may have particular issues regarding deliveries that are not common with other types of retailer.

Of the 79 businesses in the survey, 39% stated that they sometimes used the main suppliers/logistics provider's delivery vehicles to specifically back-load customer returns. While these were predominantly scheduled deliveries, 80% of these back-loads were 'on demand', indicating that the back-loading of customer returns tends to be used on an 'as needs' basis, rather than as a matter of course. Back-loading the main suppliers/logistics providers delivery vehicles with stock for return to the supplier/distribution centre was also cited as an activity undertaken by 45% of the respondents while 42% had at sometime back-loaded stock for rotation to other stores. Of those that indicated the destination of these stock returns, most were being taken to a Distribution Centre, presumably for consolidation and re-allocation. Only 15 of the respondents (18%) claimed to back-load any waste or recycle using the main suppliers/logistics providers delivery vehicles.

Of the 238 weekly core goods deliveries received by the 79 respondents from their main supplier/logistics provider, approximately 37 vehicles per week (16%) serving 12 retailers always back-loaded returns (related to customer returns or stock returns) according to the store manager. In terms of back-loading frequency, 18 businesses said they used back-loading at least once a week (Table 25) with 7 of these stating that waste products were taken back using the delivery vehicles.

Table 25: Number of businesses on Winchester High Street who use their main supplier for back-loading, by frequency category.

	Any returns	Customer returns	Stock returns	Stock rotation	Waste
Always	9	8	7	8	4
Daily	4	2	3	2	2
Weekly	5	2	2	4	1
Sometimes	15	10	12	10	5
Less frequently	26	7	8	6	0
Never	33	48	43	45	65

Four of these 18 relied on a logistics provider to take back returns or stock whilst 10 of the respondents stated that these main suppliers/logistics providers operated scheduled collections for these returns. Eight of these businesses stored returns in preparation for these collections, usually in the area reserved for stock, and generally, back-loaded returns were presented for collection in either boxes or totes but given the small sample, a variety of other collection methods could be anticipated depending on the product type (roll cages, hangers, pallets etc.).

Where information was available, the destinations of the distribution centre/supplier receiving the back-loaded vehicles were obtained from the interviewees. From the 18 main suppliers/logistics providers regularly taking back-loads, vehicle destinations tended to be in the Southern half of Britain, with 6 in South Hampshire and 2 in London, while 6 travelled slightly further to Central England. One respondent stated that back-loads were destined for Carlisle.

3.11.1 The use of ‘dedicated’ vehicles for transporting returns

As well as providing information on the returns handling characteristics of core goods delivery vehicles visiting businesses in Winchester, respondents were also asked to provide details of any ‘dedicated vehicles’ used solely to transport returns. Of the 83 respondents, 19 retailers (23%) said they did so, 8 of which (42%) indicated that these vehicles took away the majority of their returns. The results suggested that if the majority of the returns generated by a business were collected by dedicated vehicles, there was little or no back-loading observed and *vice versa* with only one business claiming to use back-loading and dedicated returns vehicles. Respondents claiming to use dedicated returns vehicles were from the charity shop, clothing retail, footwear, mobile phone, optician, and ‘other retail’ business categories. In a number of cases, dedicated returns vehicles were used very infrequently, implying that returns were stored up over a period of time to generate a significant volume to warrant a collection.

Information on the particular suppliers/logistics providers providing dedicated returns services were gathered (Table 26). Many logistics providers appear to handle returns for only one business, although one carrier attended three opticians in the High Street on a daily basis during the afternoon at a fixed time. It seems probable that this would be the same vehicle attending all three, but it is not possible to confirm this from the survey. DHL was used to handle returns for 5 businesses although none were used on a regular basis (3 were used ‘infrequently’, 2 ‘on demand’)

Table 26: Providers of dedicated vehicles handling returns.

	Amtrak	ANC	British Heart Foundation	City Link	DPD UK	DHL	Hays DX	Newlife	Parcel Force	Parcel Line	Shoebiz
Charity shop			1								
Clothing retail	1			1				2			
Footwear									1		1
Mobile phones					1					2	
Opticians							3				
Other retail		1				5				2	

Of the 8 respondents for whom dedicated vehicles undertook all their entire returns management, all the vehicles used were vans, 5 of which were from a logistics provider, while 3 were couriers handling returns. Each of the couriers took away returns every day. Again, as for back-loading, the containers used to transport these products were mostly boxes, totes or bags.

3.11.2 Customer returns policies and returns management practices

Sixty of the businesses in the survey had a returns policy (72% of respondents), and were asked to provide basic details of these. Of these, 52 (87%) had a website of which 49 (94%) offered on-line purchasing of goods. Of these 49 businesses offering on-line shopping capability in addition to their High Street store, 26 (53%) allowed goods that had been purchased on-line to be taken back to the High Street store under their customer returns policy. Of these 26 stores, only 14 (54%) had the same return period for both their high street store and the online equivalent. Of those with no returns policy, most were from the services sector (e.g. food retailers, pubs, restaurants, estate agents, travel agencies). Seven of the 60 respondents with a policy (Figure 30) had a relatively short customer returns period of 14 days; another two had a 21-day policy, while 36 allowed up to a month for customers to return products. Some retailers would accept a return if the product was considered faulty whilst others said that they would only accept returned items if they were in re-sellable condition. One retailer stated that the acceptance of fault regarding customer returns was at the manager's discretion.

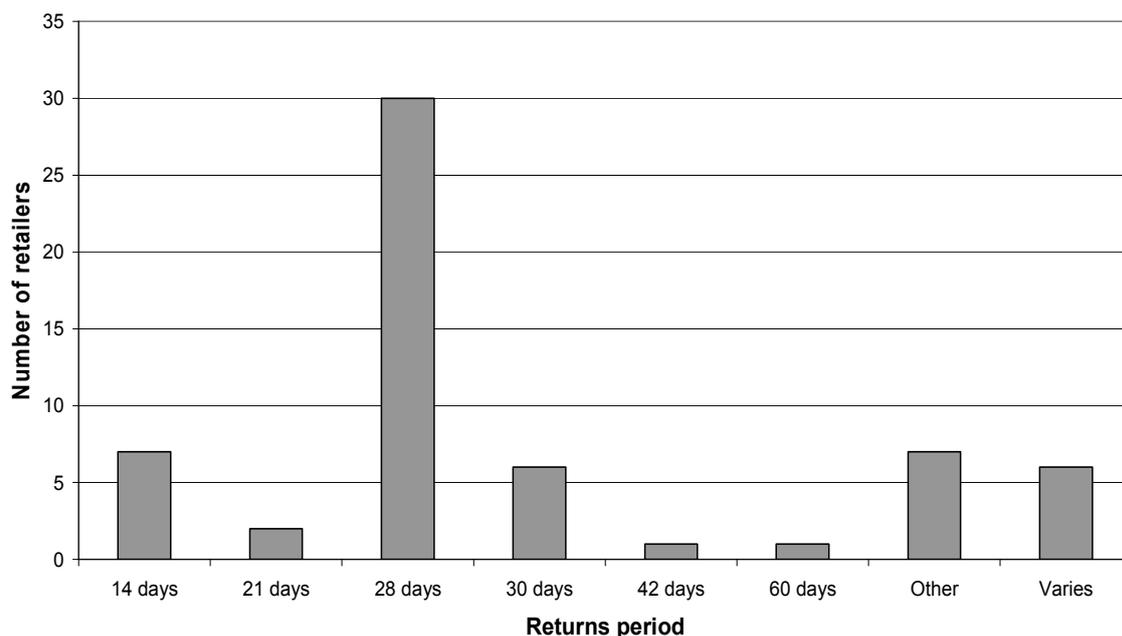


Figure 30: Customer returns periods of the 60 businesses on Winchester High Street offering a returns policy.

From the 60 respondents offering a returns policy, 17 (28%) indicated that they required goods to be returned in the original packaging whilst 26 (43%) would accept products presented without. Overall, 80% of the respondents stated that regardless of original packaging, the original proof-of-purchase receipt was required before a return would be accepted. Somewhat surprisingly, 8 respondents (all multiple chains) stated that a receipt was not required. Figure 21 shows a schematic of a typical supply chain, with the inclusion of the recovery process. While the Test facility ('gate-keeping') is optional, consolidation of returns, especially those relating to WEEE, may offer important benefits in reducing freight kilometres travelled.

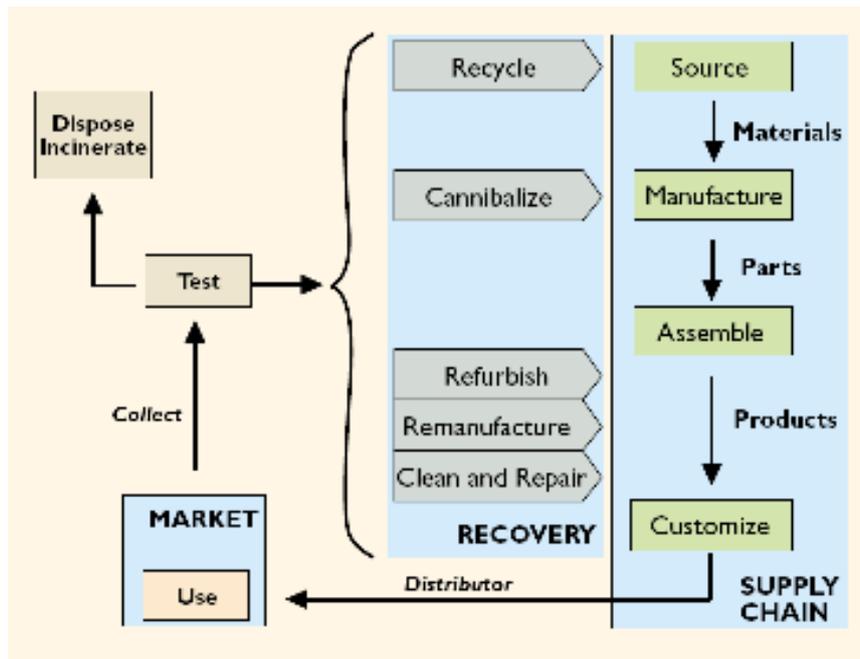


Figure 11: Recovery processes incorporated in the supply chain (from Hillegersberg *et al.*, 2001)

The costs and other implications of managing product returns can be problematic for retailers. Some, particularly the larger chains, manage returns themselves, while others control their management by outsourcing these responsibilities to third party logistics providers when it is not financially viable to set up their own systems. Of key importance is the extent to which the local store has the capability and expertise to accurately assess the returned product and make the decision on what disposition route it should then follow (return to 'Grade-A' stock, return for repair, return for cannibalisation/parts, pass on to a jobber/3rd party, pass into the waste stream). The returns related transport that can be generated is therefore dependent on this decision ('gate-keeping') process which is often done away from the store due to the expertise required.

Respondents were asked to indicate (by following a simple flow diagram), whether returns were inspected in store, and if so whether any electrical testing was carried out prior to dispatch. Of the 83 respondents, 23 (28%) stated that they did not inspect returns in store. The business types for which no checking was carried out were primarily those for which no customer returns were generally expected (e.g. restaurants, pubs, confectioners, bakers, etc). The results indicated that almost all of the retailers who expected to have to handle customer returns had in place some rudimentary process to carry out initial checking of the item in-store.

The results also suggested that 25% of the 60 respondents who did carry out in-store inspections of customer returns had a more sophisticated 'gate-keeping' function as they tested electrical and

mechanical items to determine their status. These respondents were also asked to indicate whether the electrical or mechanical items would be sent away if testing showed that any problems could not be resolved in store. Nine respondents indicated that this would be the case with 2 returning faulty goods direct to the supplier with 3 sending them to a distribution centre and 1 to the companies head office. From the respondents, 62% who indicated that they did inspect returns in-store could not give further details of the next link in the returns chain once the items had been collected from their store.

When respondents were asked to indicate what happened to their most common returns (Figure 32), 60% attempted to return items to Grade-A stock for re-sale in-store, rather than send them elsewhere, with 17% returning items to either the supplier directly or to a distribution centre. When looking across specific business categories, on average across the 13 clothing retailers who supplied information, 85% of their returned goods were passed back into Grade-A stock (median 95%. STDEV, 24.6) with the remainder either being returned to individual suppliers in decentralised systems or the distribution centre if the business was served by a centralised logistics operation. Similar characteristics were observed for footwear retailers (98% of returns passed back to Grade-A stock on average) and jewellers (97%). In the case of the 6 mobile phone stores, no returns were passed back to Grade-A stock and all were sent away either direct to the particular manufacturer or to the distribution centre serving the business.

Five percent (3 retailers), 2 food retailers and 1 selling cosmetics, tended to dispose of all products that were returned. The ability to offer returns for immediate re-sale is very dependent on the product. Clothing can be relatively straight forward in terms of re-sale potential but certain items (boxed electrical goods) require all the associated manuals, paperwork and accessories to be present with undamaged packaging if they are to return to Grade-A stock.

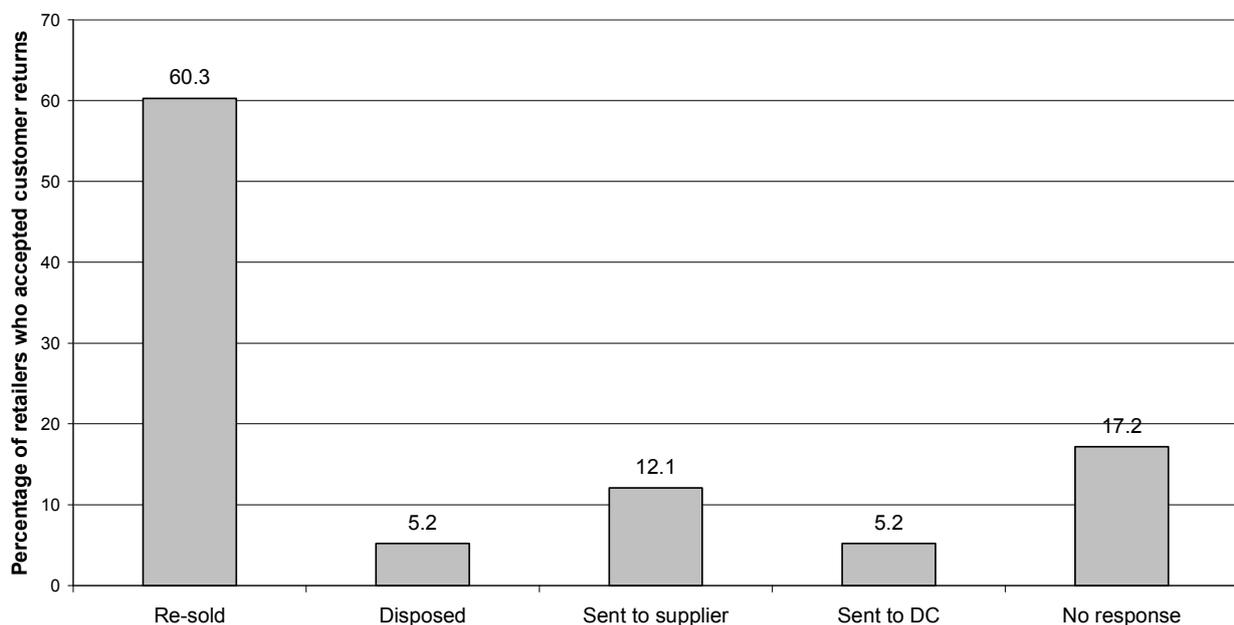


Figure 32: Percentage of Winchester High Street businesses (n=58) using particular disposition methods for customer returns

From the respondents who accepted customer returns, 25% indicated that the collecting supplier or logistics provider specified how the products should be handled and managed in-store, pre-collection. These specifications were generally restrictions on storage and handling such as ensuring that products were boxed securely and/or in specific containers (e.g. totes), and did not exceed certain weight specifications.

Despite the fact that many of the most common customer returns were seemingly put straight back to Grade-A stock in-store, 68% of the respondents claimed that they still had a need to store returns prior to returning them. Thus, while the re-sale of many customer returns will reduce the amount of stock and other materials being sent back through the supply chain, there are still some items that need to be returned. The fact that 68% of the respondents who handle returns have to store items using the appropriate transportation mediums (boxes, totes, roll cages etc.) means they have to create space for such storage to be possible.

Across the respondents, 24 businesses gave details of specific locations where returns were taken by their main supplier/logistics provider (the first leg of the gate-keeping process), and using the post code destinations, it was possible to derive a shortest-path road distance for the trip (Figure 33). The average distance travelled was 86 miles (138 km), with the maximum being to Carlisle (317 miles, 610 km) and the minimum being Winnall, a business park on the outskirts of Winchester (1 mile, 1.6 km).

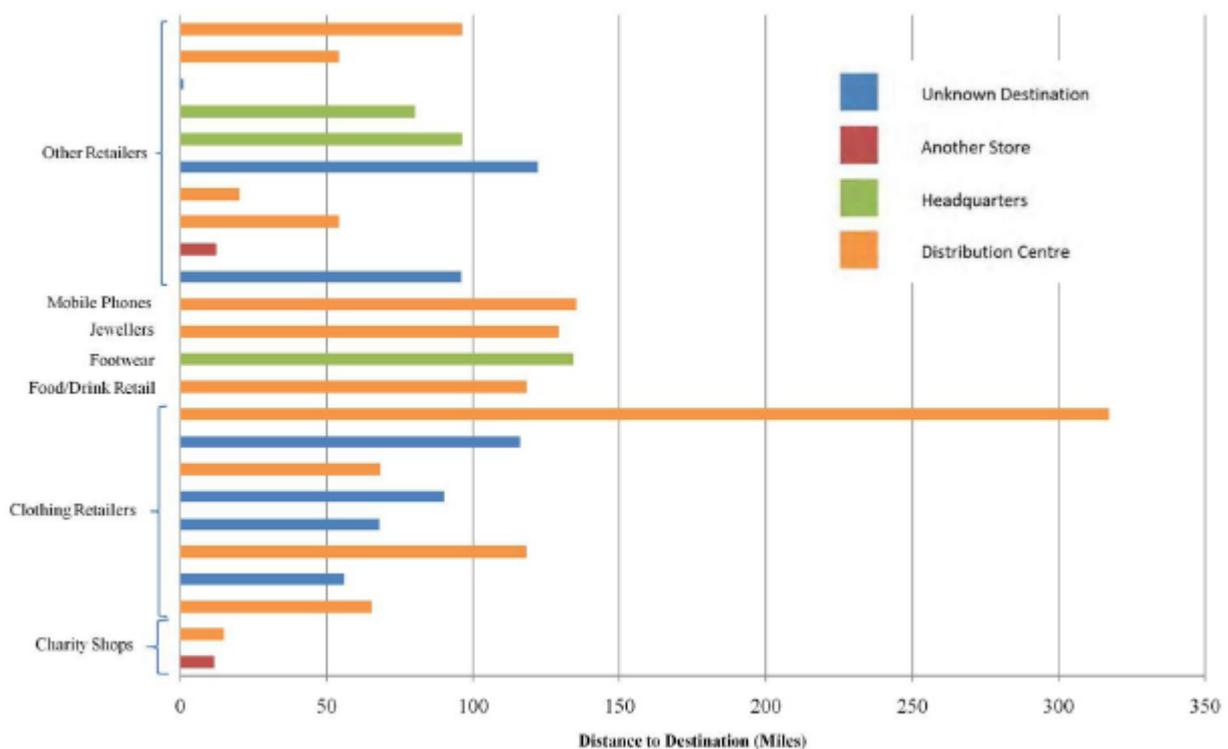


Figure 33 Shortest path road distance of returns loads by the main supplier/logistics provider reported by 24 businesses in the Winchester High Street business managers survey. (Hardwick, 2009) (N.B. These represent the first leg in the take-back cycle and there could be other trips servicing subsequent disposition routes dependent on the outcome of the gate keeping process)

4 Service vehicle visits

Freight vehicle activity in a retail centre is commonly construed as being 'core goods' related. In order to get a complete picture of commercial vehicle movements and to fully understand their influence, it is important to quantify the impacts of service vehicles which support the business activity on a daily basis. The Winchester High Street business managers were questioned about service vehicle activity to their premises. The results suggested that on top of the estimated 618 core goods deliveries received during a typical week by 107 businesses on the High Street (5.8/week/business on average), an additional 1049 service visits (9.8/week/business) may also take place (section 4.3). These findings mirror those from the West Sussex towns surveys (Cherrett and Hickford, 2005) which suggested that service visits made up 56% of the freight vehicle activity during a typical week.

4.1 Service types and frequency reported by businesses in Winchester

Looking across the findings from the 2008 and 2001 Winchester surveys, the most common service visits were for post delivery (3.3/business/week on average) and waste collection (2.4/business/week). Other service visits which typically occur on a weekly basis are for cleaning (the inside of the premises), window cleaning, delivery of ancillary products (for the essential operation of the business) and dedicated mail collections, Figure 34.

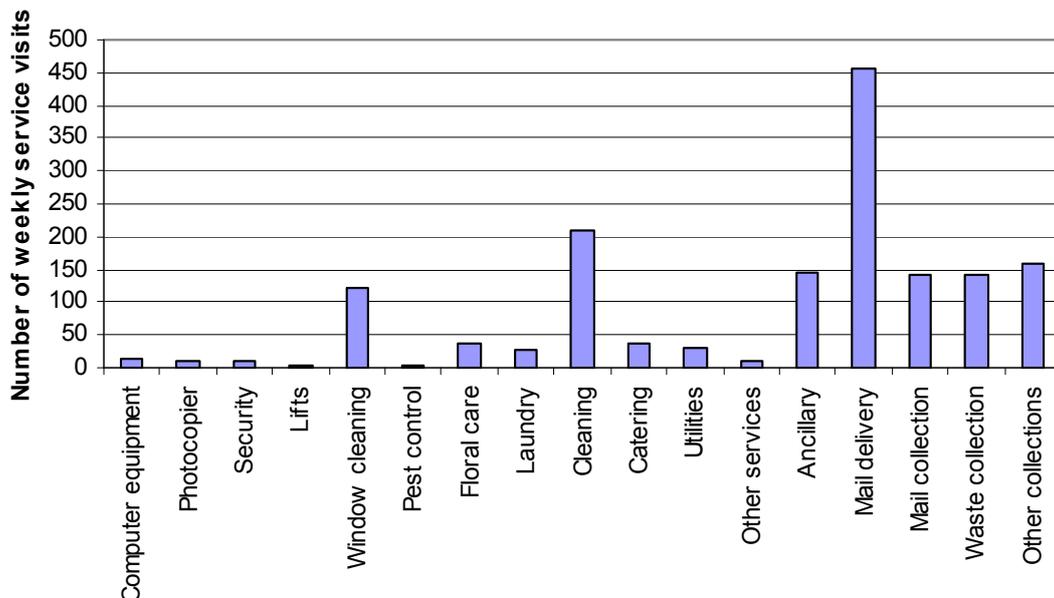


Figure 34. The mean number of weekly service visits to businesses in Winchester by type of service (2001 Winchester survey).

The proportions (%) of High Street businesses receiving common service visits by category are shown in Figure 35. Various other types of specialist service visit were also made less frequently, including visits from sales reps, provision of water, stationery and optical equipment and for servicing vending machines.

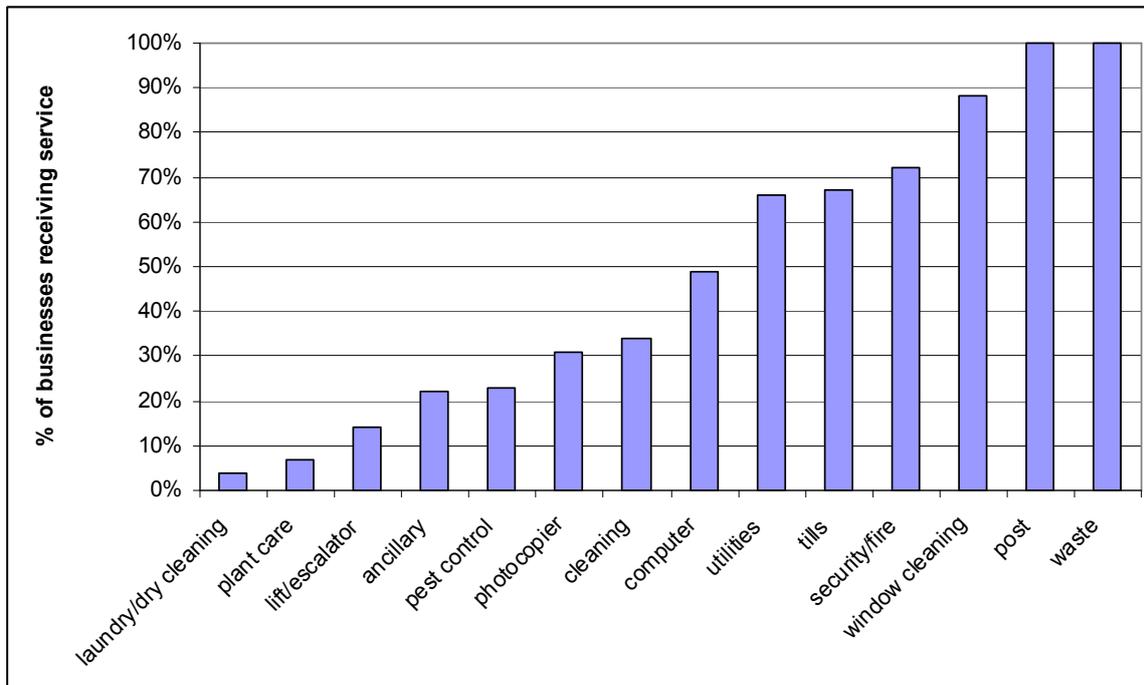


Figure 35. Proportions (%) of businesses on Winchester High Street receiving service visits (2008 Winchester study)

Computer and photocopier servicing was reported by 49% and 31% of the respondents respectively with till maintenance being a service called in by just under 70% of respondents. Postal activity (deliveries and collections) was reported by all respondents and most businesses received postal deliveries every working day. From those businesses who provided data, the majority stated that window cleaning occurred once a week, with 61% stating that general cleaning occurred on most days of the working week. The maintenance of security and fire fighting equipment occurred a few times per year on average with pest control services occurring monthly. Till, computer and photocopier maintenance tended to be undertaken 'on demand'.

Some urban freight studies have attempted to compare the number of service trips with the number of core goods deliveries per urban establishment to gauge the relative impact of each in terms of traffic generation (Table 27).

Table 27. A comparison of weekly service and core goods vehicle activity to urban establishments (adapted from Allen et al., 2008).

Study	Mean no. service visits/business/week	Mean no. core goods deliveries/business/week	Service trips as a % of total delivery & service activity
Norwich (2001)	2.7	21.6	11%
Winchester (2001) ¹	8.6	8.3	51%
Bexleyheath (2003)	5.7	16.2	26%
Chichester (2005)	7.9	6.4	55%
Crawley (2005)	7.1	5.7	55%
Horsham (2005)	8.7	8.9	49%
Worthing (2005)	12.6	7.3	63%
Winchester (2008) ²	9.8	5.8	63%
Mean	7.6	10	47%

¹From 137 respondents from across Winchester

²From 107 respondents on Winchester High Street

Across 8 studies, service trips on average accounted for 47% of the total delivery and service vehicle activity with 5 of the studies reporting a share of over 51%. The mean number of service visits per week generated by each business category was estimated from the responses received by the business managers and compared against the appropriate 2001 survey figures (Figure 36). Due to the numbers of respondents in each business category, it was not possible to undertake any statistical comparison between business types in terms of the mean number of service visits received. The 2001 survey only involved 39 stores from the High Street and the 2008 dataset offered a more comprehensive overview of likely service vehicle impacts.

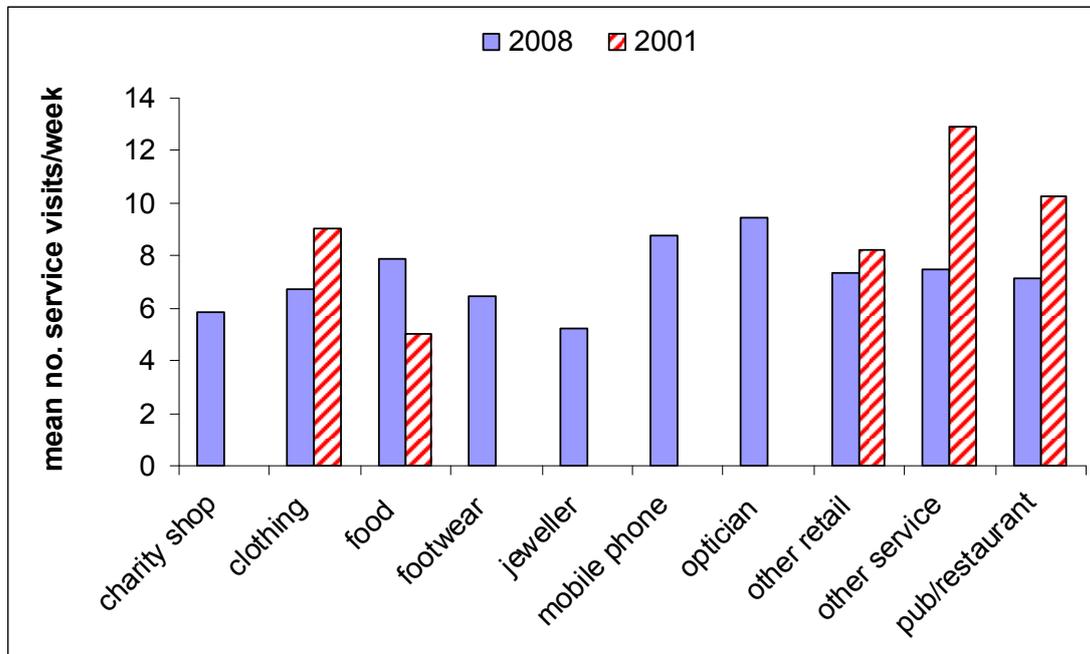


Figure 36: Mean no. of service visits per week to businesses on Winchester High Street by business type

Given that up to 70% of service visits can be made by motorised transport, and that in five of the eight studies where service activity has been studied, weekly service visits outweighed weekly core goods vehicle activity, their impact can be considerable. The West Sussex town’s surveys (Cherrett and Hickford, 2005) suggested that during a typical, non-peak trading week, one would expect 4 of the 47 businesses to receive engineer visits for the maintenance of computer equipment, 10 for security equipment, 3 for lift/escalator overhaul and 2 visits for pest control. Overall, the 47 businesses who provided information generated 475 service visits during a typical week’s trading (10 per business/week) with 83% of these being undertaken by motorised transport.

4.2 Service dwell times and associated vehicle types reported by business managers

The High Street business managers were asked how long service visits typically took at their premises, with various time bands being selected: 1-15 mins, 16-30 mins etc. An ‘average’ duration was calculated for each service category assuming the mid-point value in each time band. Comparisons were made with figures obtained from the 2001 study of businesses from across Winchester (including the more industrial areas of Bar End and Winnall), and the West Sussex Town’s Survey (Cherrett and Hickford, 2005) involving 47 respondents from Chichester, Crawley, Horsham and Worthing), Figure 37. From the 2008 survey, mail delivery/collection was typically under 10 minutes duration although two businesses stated that it typically took between 16-30 minutes to receive and dispatch their mail. The average figure of 8 minutes is likely to be an over-estimate of the true time but many businesses will have signature requirements and will also have varying amounts for collection. The vast majority of window cleaning visits were under 15 minutes

in duration, although two of the larger businesses stated that the process took more than two hours to complete. The average cleaning visit was estimated to be around 78 minutes, with 9 businesses stating '1-2 hours' and 5 businesses stating 'more than 2 hours'. Visits for equipment repairs and servicing (tills, computers, photocopiers and lifts) were all estimated to be around 90 minutes on average.

The overall mean dwell time across all service categories (including postal deliveries) was estimated at 30 minutes, (37 minutes excluding postal deliveries).

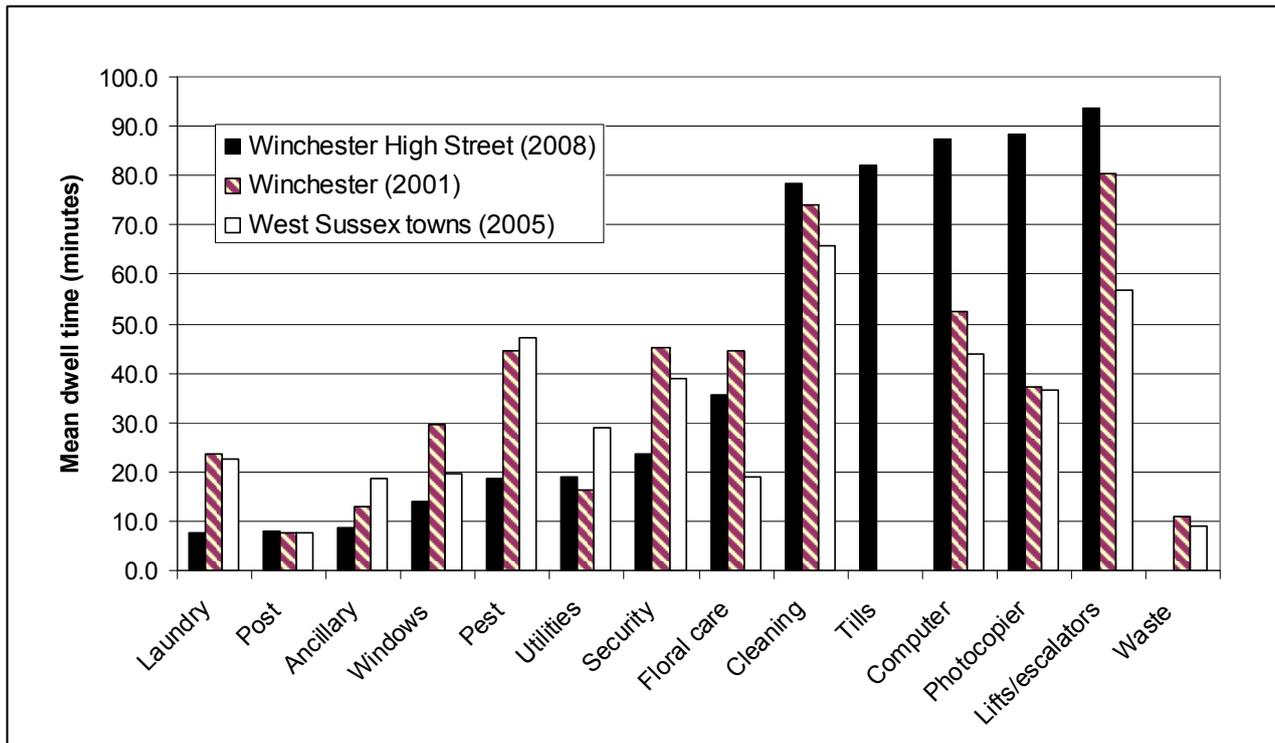


Figure 37:- Mean dwell times by service activity (minutes)

Comparing the 2008 data with the 2001 survey (Figure 37) suggested that in Winchester, the reported 2001 dwell times for laundry, window cleaning, pest control and security/fire were considerably higher than those reported in the 2008 survey. This could be due to the numbers of larger businesses (some industrial and manufacturing) from outside the High Street making up the 2001 respondent sample.

The surveyed businesses were asked what mode of transport was used by the service companies visiting their premises. This was broken down by the type of service and an overall comparison was made with the 2001 study (Figure 38) and the findings from the West Sussex Town's Study (Cherrett and Hickford, 2005). The vast majority (90%) of the business managers said that the post person arrived on foot but it should be noted that vans are often used to supply post to the area from where final deliveries are made on foot, and the 2001 study suggested that in 46% of cases, a van was actually used. The results from the two studies suggested that approximately 70% of service visits may be made by motorised transport, of which approximately 49% are vans. The results suggested that there had been a reduction in overall van use for service activity between the 2001 and 2008 surveys (down 10%) with a similar increase in visits made on foot.

Of interest is that the mean dwell time across all service types (2001 survey from 137 respondents) was 35 minutes, and bears similarities to the West Sussex Towns surveys (Figure 37) where lift/escalator maintenance, cleaning, computer maintenance, security and pest control all took over 40 minutes on average. The West Sussex surveys (Cherrett and Hickford, 2005) suggested that each business could generate 2.5 hours of service vehicle stationary time per week which could be directly outside the premises or in local car parks.

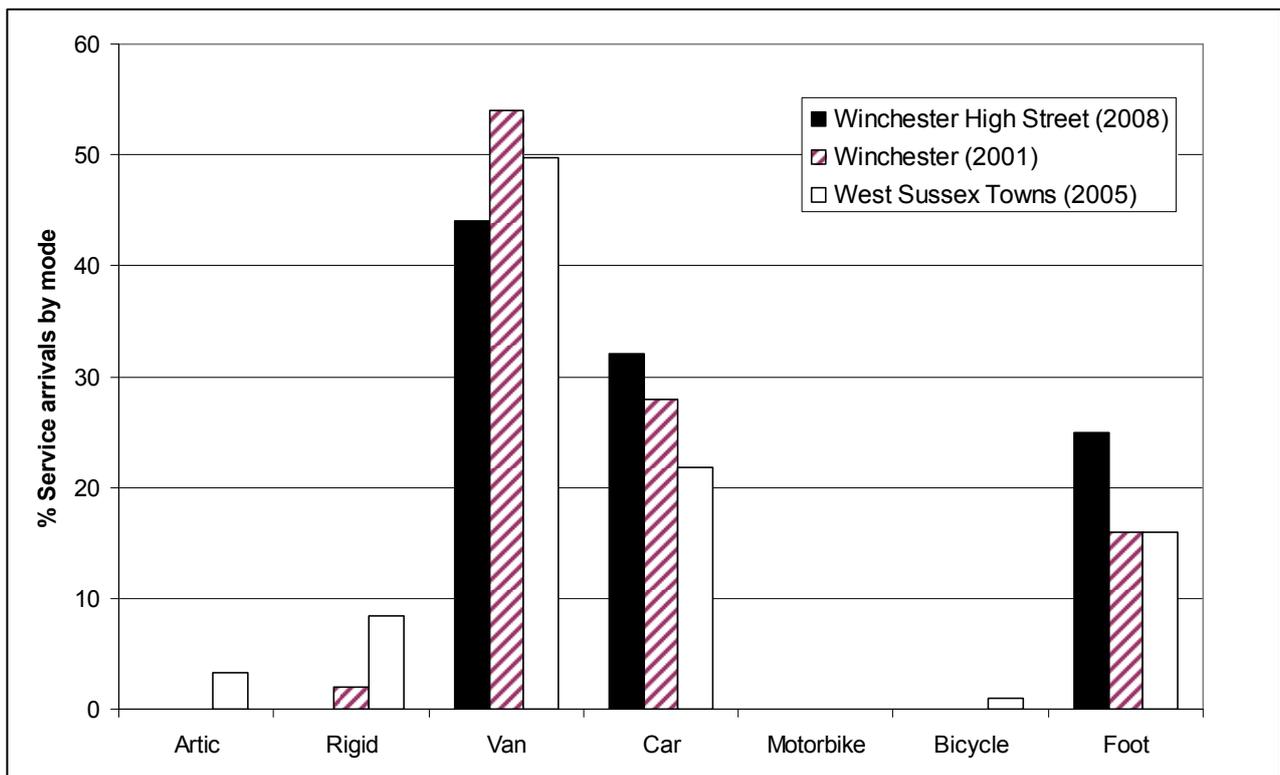


Figure 38:- Mode of transport used for service visits in Winchester (2008 and 2001, excluding post) and West Sussex (2005, Chichester, Crawley, Horsham, Worthing).

Service vehicle activity is clearly a significant contributor to urban freight movements and due to its very nature, often requires vehicles to be parked close to the premises being served. A survey of 13 service providers servicing 438 clients in Winchester (Cherrett and Smyth, 2003) suggested that 38% of the vehicle activity involved parking on a public road near the premises with 31% off-street at the clients premises. The Colchester study, using a sample of 244 town centre establishments suggested that 76% of service providers' vehicles were parked on a public road whilst the service was carried out (Allen et al., 2008).

Taking the mean number of service visits per establishment per week (9.8) from the 2008 Winchester study and assuming that:

- 3.3 are mail related (8 minutes per service),
- 2.4 are waste collections (8 minutes per service)
- 2 are cleaning (78 minutes per service)
- 1 is window cleaning (20 minutes)
- 1 relates to 'another' activity (mean time across all the service categories of 30 minutes),

4 hours 11 minutes of service activity per week could be a routine occurrence at the typical high street business in Winchester (50 minutes per day assuming 5 days). Assuming that 70% of this would involve motorised transport (2 hours and 56 minutes) and that 38% could be parked on-street, the average business could generate a minimum of 1 hour and 7 minutes of service vehicle dwell time on-street per week (13 minutes per day assuming 5 days). This only relates to regular weekly service activities and more infrequent scheduled maintenance and on-demand call outs could see this increase.

In terms of business processes that could be targeted to reduce overall freight vehicle impacts, centrally co-ordinating elements of service provision (e.g. for cleaning or equipment maintenance), or providing improved, more flexible parking provision for service vehicles could be more beneficial to reducing overall freight impacts than focusing on core goods deliveries. In the case of the latter,

Winchester City Council implemented a 'pay-as-you-leave' charging system at the central car parks designed to encourage short-stay service vehicles to park off-street.

4.3 Estimated number of service visits to the Winchester High Street sample businesses

The responses were used to estimate the total number of weekly service visits made to the 83 business respondents on Winchester High Street (Table 28). For each frequency category ("most days", "once a month" etc given in the interview questionnaire), an appropriate factor, or multiplier, was used to transpose the number of visits into an estimated number of service visits per week. Where business managers had responded using the "On demand", "Varies" or "Don't know" categories for a particular service frequency, a factor of 0.04 (equivalent to two visits per year) was assumed. Clearly, it is difficult to attach numbers to these categories and the figures assumed may be somewhat lower than reality. The results suggested that a total of 814 service visits per week may be made to the 83 respondents using this methodology (9.8 per business per week).

Table 28: - Estimated weekly service visits made to businesses on Winchester High Street

Service Category	Visits per week
post	386.0
waste	199.0
window cleaning	95.8
cleaning	95.0
security/fire	13.5
ancillary	5.2
utilities	4.3
laundry/dry cleaning	3.0
plant care	2.8
pest control	2.7
tills	2.6
computers	2.2
photocopier	1.6
lift/escalator	0.6

Post and waste clearly dominate as common service activities and it should be noted that these are not likely to involve solely dedicated trips by vehicles to individual business but more co-ordinated, scheduled rounds involving a set number of vehicles undertaking multi drops/collections. Similar co-ordinated service activity may be undertaken across a range of the services (e.g. plant care, security/fire, pest control) and it would be wrong to assume that the weekly estimated numbers equate to separate vehicle trips.

4.3.1 Service activity related to clients and round structures

The 2001 Winchester business managers' survey produced contact details for 49 service providers who regularly visited businesses in the city. As part of a subsequent service providers survey (Cherrett & Smyth, 2003), a sample of 13 gave detailed information about their daily operations serving clients in central Winchester, Table 29.

Table 29. Service providers serving clients in central Winchester (Cherrett & Smyth, 2003)

Service Provider	Nature of Business
Minster Cleaning Services	Contract cleaning of commercial premises, window

	cleaning, janitorial supplies
Atherley Cleaners Ltd	Dry cleaners
Toshiba Electronic imaging Solutions	Photocopier / fax machine maintenance
Stannah	Lift service/repair
ADT Fire and Security	Servicing and maintaining intruder alarms and CCTV
Initial Textile Services	Specialised work place cleaning (work wear, tea towels, mats and consumables)
Churches Fire Security Ltd	Fire extinguishers / alarm service & supply
Allclean Services	Window cleaning contractors
Copyrite Business Solutions Ltd	Supply and servicing of office equipment (photocopiers)
Sapphire Cleaning Services	Carpet and upholstery cleaning
Thresher Group	Off license retailing
OTIS Ltd	Installation, modernisation, service and maintenance of lifts and escalators
Quilver Business Services	Office equipment sales and maintenance

The results suggested that across the 13 respondents, 438 separate clients were visited across the wider Winchester area (incorporating the central city, Bar End and Winnall), generating approximately 147 weekly trips (Table 30). Across all the service categories, the average service provider had 34 customers and made 11 visits per week. Due to the small sample of respondents, it was difficult to derive meaningful figures for each service category. Table 31 shows the mean number of clients and weekly visits made by service type. The average cleaning company had 8 clients in Winchester and made 25 visits per week whereas the average office equipment maintenance company had 15 clients and made 2 visits in a typical week.

Table 30. Number of clients served in Winchester and the number of weekly visits made (Cherrett & Smyth, 2003).

Service Company ID	No. of clients in Winchester	Weekly visits to Winchester
5	17	68
37	4	4
46	15	2
29	20	2
33	50	10
39	90	5
10	100	20
49	66	20
38	19	2
42	3	2
14	4	3
36	30	7
27	20	2
Total	438	147
Median	20	4
Standard Deviation	32.7	18.2
Mean	34	11

Table 31. Mean number of clients served and weekly visits made to clients in Winchester by service type (Cherrett & Smyth, 2003).

Service Type	Total Respondents	Mean no. of businesses	Mean no. weekly visits
--------------	-------------------	------------------------	------------------------

		served	
Cleaning of premises	3	8	24.7
Lifts / escalators maintenance	2	25	4.5
Other (workwear)	1	90	5
Photocopier /office equipment maintenance	4	14.5	2.3
Security / fire equipment maintenance	2	75	15
Window cleaning	1	66	20

The service providers were asked to describe how their visits to clients in Winchester were arranged. One concept for making urban freight movements more sustainable would be to co-ordinate service engineer visits through a third-party. This could reduce the number of weekly trips made by 'chaining' visits to different customers on the same day. This process would function well where businesses operate a fixed schedule system where service providers make regular timetabled visits. Thirty nine percent of the respondents (Table 32) followed a pre-arranged schedule with their clients, as well as operating other systems (service-by-request and service request through a Head Office). 'Service-by-request' was the common method used by office equipment maintenance companies, whereas the lift and escalator service providers used all three systems. 'Other' service booking methods mentioned included cold canvassing and courtesy visits to clients when visiting an area.

It appears that there could be scope for co-ordinating service visits in urban areas if data on maintenance schedules could be shared. No information was gathered which indicated the current level of service schedule co-ordination by individual service providers or between service providers.

Table 32. Methods service providers used to arrange visits to their clients in Winchester

Service type	Total respondents	Customers contact the service provider directly	Service provider receives orders through HO	Service provider follows pre-arranged schedule	Other	Totals
Cleaning of premises	3	1	0	2	0	3
Lifts / escalators maintenance	2	2	2	2	0	6
Other (workwear)	1	1	0	1	1	3
Photocopier /office equipment maintenance	4	3	1	1	1	6
Security / fire equipment maintenance	2	2	0	2	0	4
Window cleaning	1	0	0	1	0	1
Totals	13	9 (39%)	3 (13%)	9 (39%)	2 (9%)	23

4.4 Service visit activity times

The service providers in the 2003 survey were asked to state when their service visits took place (Figure 39). Large areas of Winchester City center operate a 'no-waiting' policy during the peak traffic periods (07:30 to 09:30 and 16:30 to 18:00), Monday to Saturday, and the results suggested that all of the service providers except one made visits at a variety of different times. None made visits between midnight and 05:00 with the most common time being during normal business hours (09:30 to 16:30)

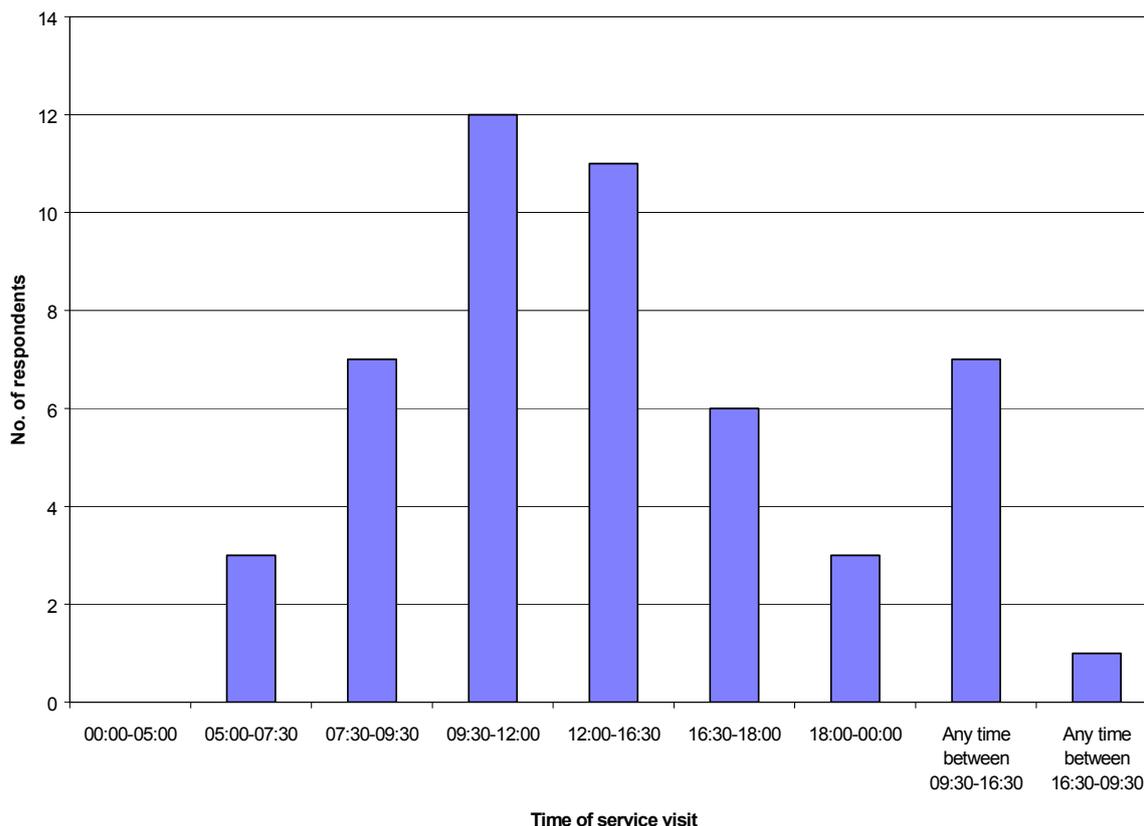


Figure 39. Service visit times to clients in Winchester (Cherrett & Smyth, 2003)

The results suggested that several service providers would be visiting clients during periods when waiting restrictions were in force. Given that the average service provider made 11 visits to Winchester in a typical week, there could be considerable demand for on-street parking spaces from this group if visits are demanded during the morning or evening peak periods. The service providers were asked to state what would be the most convenient time for them to visit their clients. The responses suggested that their business hours were generally tailored to the needs of their clients. Early mornings were mentioned by four respondents as being the most convenient business times, primarily for avoiding traffic congestion. The business managers in the 2008 High Street survey were also asked about typical service arrival times. The results (Table 33) suggested that for postal delivery/collection, cleaning of premises and window cleaning the vast majority of the activity was undertaken in the morning. For the other categories of service, the majority stated that there was no fixed service time.

Table 33:- Service visit (Winchester High Street businesses) by time of day (no. of businesses)

Service	No fixed time	Morning	Afternoon	Not known
Post	1	79	2	1

Window cleaning	9	61	1	2
Cleaning	3	20	4	1
Security/fire	55	1		4
Ancilliary	13	3		2
Utilities	50	3		2
Laundry	1	2	2	
Floral care	5			1
Pest control	18	1		
Tills	50	3	1	1
Computer	38	1		2
Photocopier	24	1		1
Lift/escalator	12	0		

4.5 Mode of transport used for service visits

The businesses were asked what mode of transport was typically used by the service companies visiting their premises and an overall comparison was made with the 2001 study (Figure 40). The vast majority (90%) of the business managers said that the post person arrived on foot. It should be noted that vans are often used to supply post to the area from where final deliveries are made on foot and the 2001 study suggested that in 46% of cases, a van was used. The results suggested that, as in the 2001 survey, over 70% of service visits may be made by motorised transport, of which approximately 43% are vans. There does appear to have been a reduction in overall van use however between the two surveys (down 10%) with a similar increase in visits made on foot.

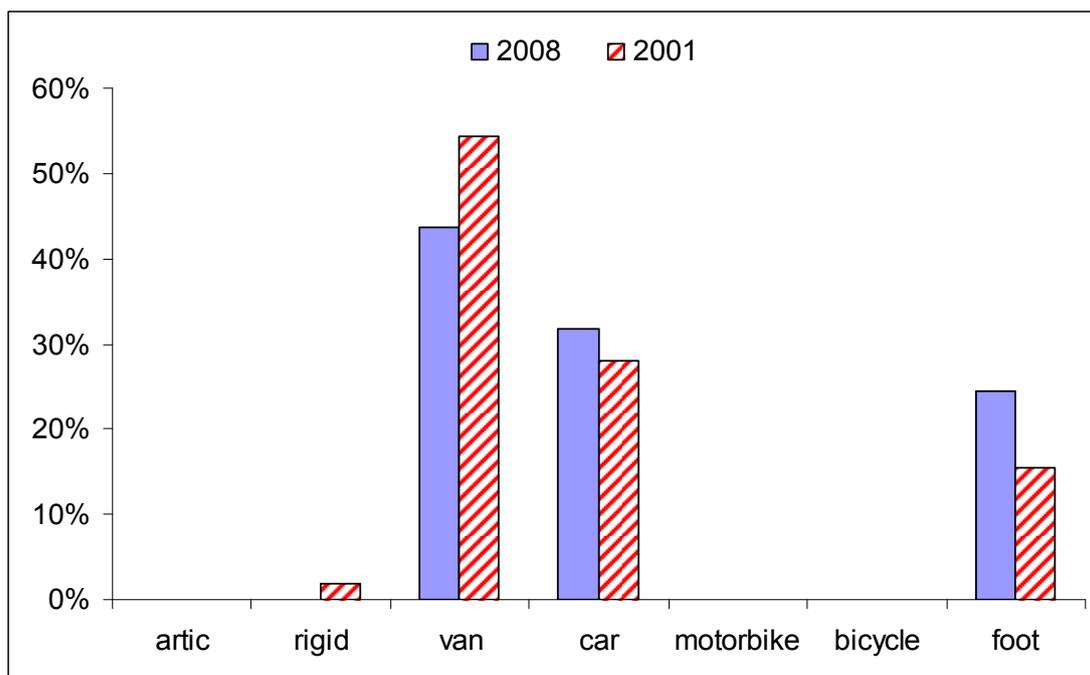


Figure 40:- Mode of transport used for service visits (excluding post)

In terms of origin points, 71% of service providers in the 2003 study (Cherrett & Smyth, 2003) stated that their visits did not start from their head office location with over 50% of the respondents stating that service visits originated from a local branch office from where an engineer serving the Winchester area would be based. Two respondents stated that service visits would originate from the engineers home, there being no local branch office. The results suggested that over 70% of service trips originated locally, either from local branch offices or engineers homes. The service providers were also asked to state where the vehicles were kept when not in use. Across all the respondents, 77% stated that vehicles were kept at an employee's home, implying that service engineers were often allotted a vehicle for their work.

5 Strategies for promoting 'greener' logistics

The findings from the 2008 Winchester study suggest that the average High Street business can expect 5.8 core goods and 7.6 service visits per week (non peak trading period). Given the predominantly on-street, kerbside nature of these activities, there is considerable dwell time taken up by freight vehicles on a daily basis, with the associated impacts on other road users. The findings have also suggested that vehicle activity differs depending on the type of business being served, with smaller independent retailers often generating significantly more weekly vehicle arrivals compared to larger multiples. Of interest was the fact that across the respondents, a single logistics provider/supplier was responsible for 82% of the delivery vehicle activity to the average business. The supply chain characteristics of these 'premier' providers warrant further investigation in an urban setting to determine any synergies that could be exploited (joint working, co-ordinated delivery times, consolidated take-back opportunities).

Consolidation centres offer a tried and tested route for optimising and consolidating the movement of core goods into urban centres across different supply chains (Browne et al., 2005). Their long-term survival however depends on the viability of the underlying business model, as a consolidation centre is often seen as a cost-adding activity, requiring local authority subsidy to fully function. In terms of urban freight planning and addressing 'green logistics' in a retail setting, an alternative could be to move the focus away from the logistics of core goods supply and concentrate on how service provision, and its associated logistics, could be improved. Given the fact that the average business on Winchester High Street received 2.4 waste collections per week and that across a sample of 74 retailers, over 17 separate waste contractors were involved in recycle removal alone, material 'take-back' could be one service area that could be optimised.

Back-loading is the obvious answer to this in which any spare capacity available on the delivery vehicles is utilised to take-back recycle, stock and customer returns. This practice suits certain types of operations where individual suppliers in decentralised systems might use their own fleets to take-back material to their manufacturing point, but more commonly in centralised systems, where logistics providers remove recycle, stock and returns back to a distribution centre for sortation and onward movement. In a drive to promote more sustainable logistics, could some of the larger retailers employing centralised distribution systems back-load recycle on behalf of their high street neighbours, particularly to help small-medium sized enterprises (SMEs)? Many of the larger High Street names utilise their delivery vehicles in this way, consolidating their own recycle (cardboard and plastics) for return to the distribution centre and onward re-use markets for financial gain. To transport other businesses' waste, a waste carrier's licence would be required by the main logistics provider. Because the delivery operations are so time critical, any consolidated recycle presented by neighbouring businesses would have to be in the correct format and presented at the right time for fast effective turnaround. Other potential barriers could involve available capacity to remove recycle during peak business periods and how variable volumes might impact on subsequent deliveries. The possible impact on a company's brand image associated with the carriage of recycle from potential rivals may also be a limiting factor. Despite these issues, the potential recycle volumes that could be extracted would make it financially attractive to major retailers as a back-loading option, and could significantly impact on the amount of third-party waste collection vehicle activity.

Delivery vehicles could also be used to service a recycle 'groupage' point which could be a distribution centre, a multi-user consolidation centre or an adapted facility (e.g. a designated area in a park-and-ride site). In this concept, delivery vehicles might get preferential access to loading bays or specific delivery slots in return for agreeing to take-back consolidated recycle from neighbouring businesses to the groupage point. The recycle would then be collected by a contractor for onward carriage and treatment. This again would reduce the amount of waste collection vehicle activity in the retail centre but would require a co-ordinating body to liaise between logistics providers, retailers and waste contractors to co-ordinate take-back loads through the groupage point. The local authority would have to play a significant part in this process and

offer incentives to the logistics providers who may not necessarily gain financially from the recycle value.

An option already being used by some local waste collection authorities (WCAs) is to utilise the existing domestic household waste collection fleets to undertake joint domestic/commercial waste collections. This is not common practice because commercial waste has to be classified separately from domestic waste and does not contribute to a local authority's recycling targets, leaving little incentive for WCAs to collect it. Also, waste disposal authorities (WDAs) may charge WCAs considerably more for disposing of commercial waste than for domestic waste. New Forest District Council operates such a scheme where commercial waste is collected as part of the domestic rounds 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). Clear sacks (100L) are available for the collection of recyclable material (charged per sack) and the SMEs have to purchase Council Trade Recycling Stickers and attach one to every sack to distinguish them. The WCA then quantifies the weight of commercial waste collected by referring to the amount of bags sold and by assuming a mean weight for a 100L bag (8kg). For mixed use developments, particularly in historic city centres, such a scheme could reduce the number of refuse collection vehicles and the associated mileage travelled. Research undertaken by McLeod and Cherrett (2007) 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.

Local authorities would have to be the key drivers of such 'green logistics' strategies, being prepared to stipulate that in certain areas, freight management (be it for core goods delivery or for service activity) will be undertaken in a particular way, perhaps using certain recognised processes/contractors for the benefit of all businesses in that area. In that sense, the local authority would act as the management 'landlord', similar to those running large multi-retailer shopping centres. Freight 'service plans', similar to the 'delivery and servicing plans' being developed by Transport for London (TFL, 2009) are a move in this direction.

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