Watford Kerbside Waste Composition Analysis

Watford Borough Council

Summary Report
July 2019

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Project details and acknowledgements

Title	Watford Kerbside Waste Composition Analysis
Client	Watford Borough Council
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Client reference	-
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Acknowledgements

M·E·L waste insights would like to thank Local Authority officers and staff who participated and helped in the setup and fieldwork stages of the project, and those who provided additional data and other information to inform the project. This report highlights key results, presents the results in tables and charts and discusses the findings. The views and opinions expressed in this report are those of M·E·L waste insights and are not necessarily shared by officers from Watford Borough Council.

Accuracy Statement

Results from the standard M·E·L sampling protocol for compositional analysis can be taken as accurate for each material category to within error bands of +/-10% at the 95% confidence level (2 standard deviations), assuming a normal statistical distribution. At the data entry stage, 1 in 10 parts of data that is inputted are checked with the data sheets and if errors are found all the data is then rechecked.

Introduction

Background

The London Borough of Watford currently has a combined recycling and composting rate of 44.3% (2017/18) and now wishes to study the composition of the domestic kerbside collected residual and recycling waste streams to provide current baseline data and to help inform future communication campaigns. As well as giving indications as to the current levels of waste and recycling being generated, this report also provides observations on the levels of materials that are currently recyclable at the kerbside and those which could potentially be recyclable via future schemes.

This report presents results from an analysis of kerbside collected residual and recycling waste collected during a two week period in June 2019. The survey follows on from a previous survey undertaken in 2014 and focusses on the levels and composition of residual bins, kerbside recycling containers and food and garden waste bins that are currently available for residents to place out for collection. The sampling regime involved the direct collection and compositional analysis of waste from a target of 160 properties representing four of the five main socio-demographic categories (Acorns). Results could therefore be weighted to give a better picture of the waste being collected within the Borough as a whole. Knowledge of the waste in these differing areas will help develop strategies to increase the efficiency with which its residents are recycling their waste.

Objectives

Specific aims of the work were to:

- Understand, using socio-demographic profiling which sectors of the community are producing which types of waste and which are using the recycling provision most effectively
- Detect capture rates for individual materials which are already collected separately for recycling
- Determine the amount of overall waste diverted by each recycling collection and overall
- Evaluate the amount of specific materials collected in the residual bins that could potentially be collected separately for recycling
- Evaluate the use of the receptacles used for collecting waste and recycling
- Compare figures for residual and mixed recycling containers with results from the 2014 survey.

Executive Summary

Key findings

Kerbside residual waste

- Weighted across all Acorn samples, 66% of households sampled throughout Watford presented residual waste for collection.

- In terms of waste generation, households were setting out an average of 4.7kg/hh/wk (7.0kg/hh/wk for those presenting bins).

- Food waste was seen to be the major component of residual waste forming 30.5% of the total, equating to 1.4kg/hh/wk. Of this food waste 79% is deemed to be avoidable with 25% packaged.

- Paper items made up 9.7% of the residual waste; 29% of this (0.13g/hh/wk) was alternatively recyclable at the kerbside.

- Card and cardboard made up around 3.6% of collected residual waste; 85% of this (0.14kg/hh/wk) was alternatively recyclable at the kerbside.

- Plastics formed 16.6% of the residual waste; 23% of all plastic waste (0.18kg/hh/wk) was due to recyclable plastic bottles and containers.

- 2.6% of residual waste was metallic; 73% of this (0.09kg/hh/wk) was recyclable.

- Around 1.6% of residual waste was seen to be glass; 67% of this (0.05kg/hh/wk) was due to glass bottles and jars.

- 0.6% of residual waste was found to be garden waste

- Overall, 12.6% of collected residual waste could have been placed into the blue lidded recycling bins available– the equivalent of 0.59kg/hh/wk.

- Overall, 31.3% of collected residual waste could have been placed into the food and garden recycling bins available– the equivalent of 1.46kg/hh/wk.

- In total 43.9% of residual waste collected could have been recycled alternatively at the kerbside – 2.0kg/hh/wk.

Kerbside mixed recycling – Blue lidded bins

- Over the survey, an average of 64% of households presented recycling bins out for collection.

- In terms of waste generation, all kerbside households were setting out an average of 3.7kg/hh/wk of mixed recycling.

- Overall, 5.8% of recycling waste collected from all properties was classified as contamination – the equivalent of 0.21kg/hh/wk.

- 26% of contamination was due to liquids with 24% being non-recyclable paper and card and 17% non-recyclable plastics.

- Around 89% of recyclable paper and 90% of recyclable card was correctly captured

- 80% of plastic bottles were recycled along with 41% of plastic containers
- 53% of recyclable metals were captured
- 93.5% of glass bottles and jars were recycled
- Overall, 85.5% of all materials compatible with blue lidded bins were correctly recycled.
- Kerbside properties diverted around 30.4% of their total waste through mixed recycling collections.

Food and Garden Recycling

- Over the survey, an average of 43% of households presented food and garden bins for collection
- In terms of waste generation, all kerbside households were setting out an average of 3.10kg/hh/wk of organic recycling.
- Overall 7.5% of food and garden recycling waste collected from all properties was classified as contamination – the equivalent of 0.23kg/hh/wk.
- Practically all contamination was soil and turf
- 32% of all food waste was correctly captured using the supplied container along with 99% of garden vegetation.
- Kerbside properties diverted around 25.1% of their total waste through food and garden recycling collections.

Residual Waste

Set out rates and waste generation levels

Table 1 and Figure 1 highlight the average set out rates for residual waste observed at the time waste was collected for compositional analysis. Table 2 and Figure 2 show the average amount of residual waste generated in kg/hh/wk. Each of the four Acorn samples was formed from 40 households of the dominant Acorn type. Therefore 160 households were selected to represent Watford with the set out relating to the proportion of these households actively placing out their waste.

The amount of waste in kilograms per household per week is collected from each sample of 40 households, not just those that are participating. The number of households setting out each waste container across all 40 households is recorded with the aim of collecting all presented waste and recycling. In some instances, it is not possible to collect all presented waste (resident refuses, bins have H&S issues or total collected waste exceeds vehicle capacity). The collected waste is bulked for sorting as a single sample. The amount of collected waste can then be adjusted by the set out rate for any sample where not all presented waste was collected. A table giving a brief description of the types of households typical for each Acorn category is shown in the appendix section.

Watford residents have access to a weekly collection of residual waste using wheeled bins. From this survey between 53% (Acorn 4) and 85% (Acorn 1) of households presented residual waste for collection at an average of 66%.

Table 1: Kerbside residual waste set out rates for each Acorn sample

SAMPLE	% SET OUT
ACORN 1	85.0%
ACORN 3	66.7%
ACORN 4	52.5%
ACORN 5	75.6%
WEIGHTED AVERAGE	66.1%

Figure 1: Kerbside residual waste set out rates by Acorn (%)
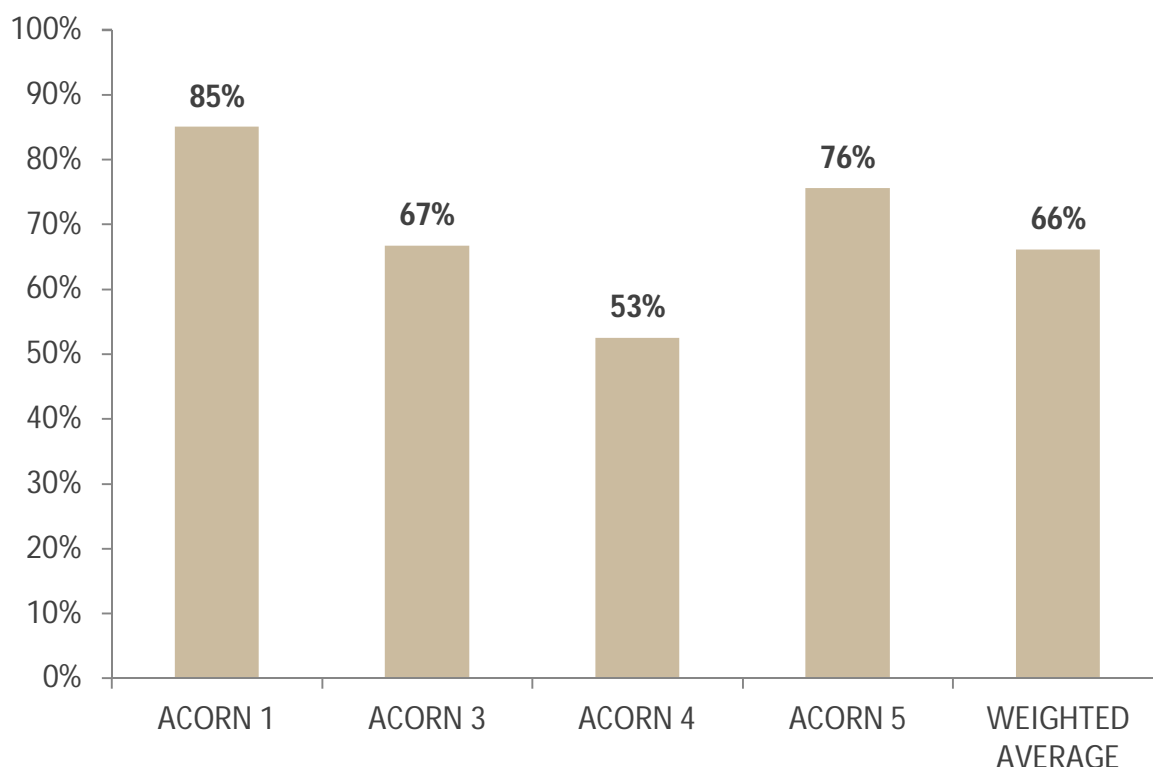
Table 2: Kerbside residual waste generation rates for each Acorn sample (kg/hh/wk)

ACORN	OVERALL KG/HH/WK	KG/HH/WK PER PRESENTED BIN
ACORN 1	4.00	4.71
ACORN 3	3.97	5.95
ACORN 4	3.00	5.71
ACORN 5	9.02	11.94
WEIGHTED AVERAGE	4.66	7.04

From observed results, the level of residual waste being disposed of at the kerbside ranged between 3.00kg/hh/wk in Acorn 4, to 9.02kg/hh/wk in Acorn 5. On average 4.66kg/hh/wk of residual waste is being disposed of by households throughout Watford. Solely considering presented bins, the average amount of waste generated is 7.04kg/hh/wk.

Figure 2: Average residual waste generation rates by Acorn

Figure 2: Average residual waste generation rates by Acorn

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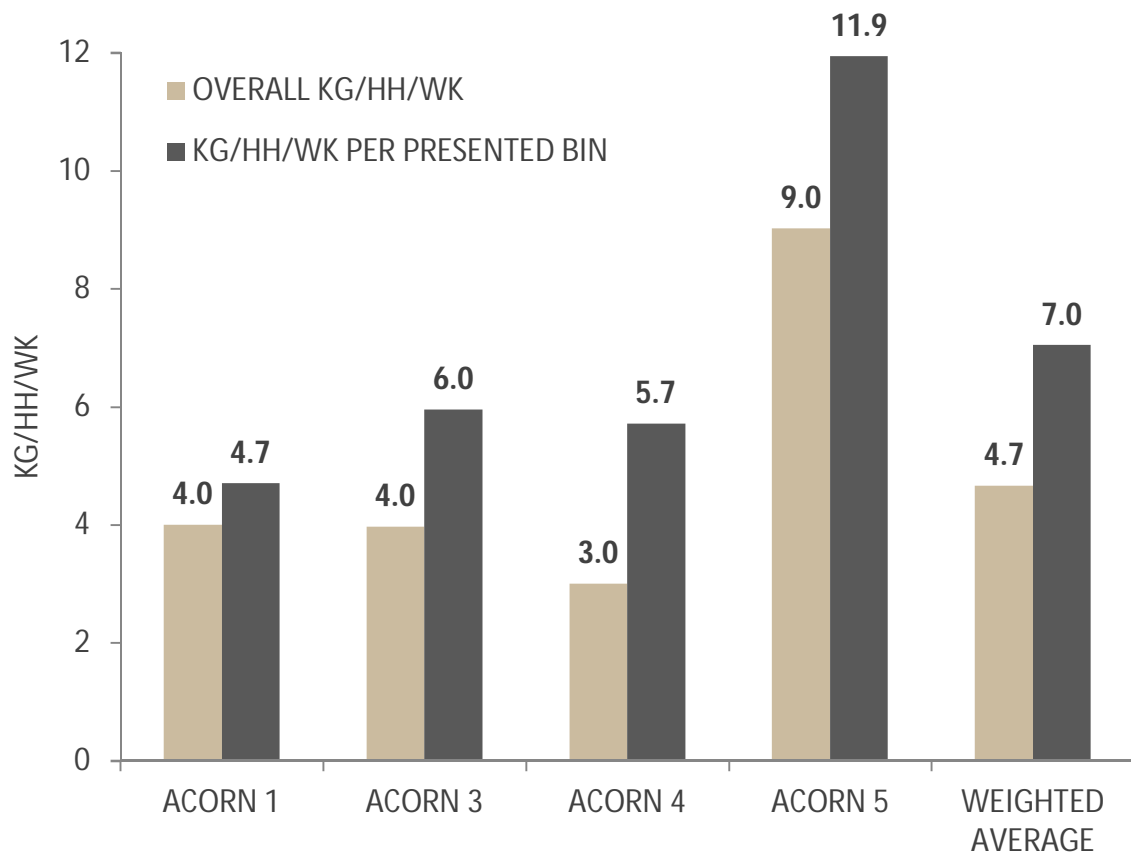
Compositional analysis of residual waste

This section looks at the average amount and composition of the residual waste presented by various socio-demographic households sampled throughout Watford   Hand sorting of the residual waste gave concentration by weight figures for the fifteen main categories of waste as well as the more detailed sub-categories.   Looking at the concentration percentages gives an indication as to the proportions of each waste category. This can be translated into a figure relating to the average waste generation expected for each waste category; this is given in kilograms per household per week (kg/hh/wk).   By knowing the composition of waste from the various Acorn samples it is possible to gain an insight into the make-up and volumes of the residual waste that can be expected as a whole. Detailed residual composition tables can be found in a separate data appendix. Table 3 and Figure 3 show residual waste data in terms of percentage composition with Table 4 and Figure 4 showing generation rates for major materials in terms of kg/hh/wk. All residual waste will contain a proportion that is classified as potentially recyclable. That is to say that it should have been placed into one of the recycling receptacles provided:-

Residents currently have a blue lidded bin for the collection of mixed dry recycling. This is collected on a weekly basis and acceptable items include:-

- Newspapers
- Magazines
- Directories
- Plain paper
- Wrapping paper (plain only, no glitter or foil)
- Greetings cards (plain only, no glitter or badges)
- Clean aluminium foil
- Plastic bottles
- Cardboard
- Food tins
- Drinks cans
- Aerosols
- Food and drink cartons (Tetrapak)
- Plastic pots, tubs and trays
- Glass bottles and jars

Residents have a green lidded bin for the collection of all food and garden waste. Compostable liners can be used to wrap food. Acceptable items include:-

- Grass clippings
- Prunings
- Leaves
- Tea bags and coffee grounds
- Fruit and vegetable peelings
- Meat and fish bones
- Plate scrapings

Table 3: Average residual waste composition weighted by Acorn (%)

WASTE MATERIAL (%)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
PAPER	13.3%	8.0%	11.5%	8.0%	9.7%
CARD	3.2%	2.3%	4.5%	3.7%	3.6%
PLASTIC FILM	10.0%	8.9%	13.8%	9.6%	10.6%
DENSE PLASTIC	7.8%	4.6%	8.3%	4.3%	5.9%
TEXTILES	1.6%	1.6%	1.6%	4.6%	2.9%
MISC COMBUSTIBLES	7.1%	38.5%	22.9%	18.5%	21.4%
MISC NON-COMBUSTIBLES	19.6%	1.8%	4.1%	2.7%	5.5%
GLASS	4.7%	2.5%	0.5%	0.8%	1.6%
FERROUS METAL	1.0%	0.2%	2.5%	0.6%	1.1%
NON-FERROUS METAL	1.2%	1.5%	1.4%	1.7%	1.5%
GARDEN WASTE	0.0%	0.5%	0.7%	0.7%	0.6%
PUTRESCIBLES	23.8%	27.3%	26.3%	40.4%	31.9%
FINES	5.3%	2.0%	0.0%	3.5%	2.6%
HHW	0.0%	0.0%	0.2%	0.0%	0.0%
WEEE	1.3%	0.1%	1.8%	0.9%	1.1%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%

Table 4: Average residual waste generation weighted by Acorn (kg/hh/wk)

WASTE MATERIAL (KG/HH/WK)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
PAPER	0.53	0.32	0.35	0.73	0.45
CARD	0.13	0.09	0.13	0.34	0.17
PLASTIC FILM	0.40	0.35	0.41	0.87	0.50
DENSE PLASTIC	0.31	0.18	0.25	0.39	0.28
TEXTILES	0.06	0.06	0.05	0.42	0.13
MISC COMBUSTIBLES	0.28	1.53	0.69	1.67	1.00
MISC NON-COMBUSTIBLES	0.79	0.07	0.12	0.24	0.25
GLASS	0.19	0.10	0.01	0.07	0.08
FERROUS METAL	0.04	0.01	0.07	0.06	0.05
NON-FERROUS METAL	0.05	0.06	0.04	0.15	0.07
GARDEN WASTE	0.00	0.02	0.02	0.06	0.03
PUTRESCIBLES	0.95	1.09	0.79	3.64	1.49
FINES	0.21	0.08	0.00	0.31	0.12
HHW	0.00	0.00	0.01	0.00	0.00
WEEE	0.05	0.01	0.05	0.08	0.05
TOTAL	4.00	3.97	3.00	9.02	4.66

Figure 3: Average residual waste composition weighted by Acorn (%)

Figure 4: Average residual waste generation weighted by Acorn (kg/hh/wk)

Legend (top to bottom):
- WEEE
- HHW
- FINES
- PUTRESCIBLES
- GARDEN WASTE
- NON-FERROUS METAL
- FERROUS METAL
- GLASS
- MISC NON-COMBUSTIBLES
- MISC COMBUSTIBLES
- TEXTILES
- DENSE PLASTIC
- PLASTIC FILM
- CARD
- PAPER

Y-axis: KG/HH/WK (0.00 to 10.00)

X-axis categories: ACORN 1, ACORN 3, ACORN 4, ACORN 5, WEIGHTED AVERAGE

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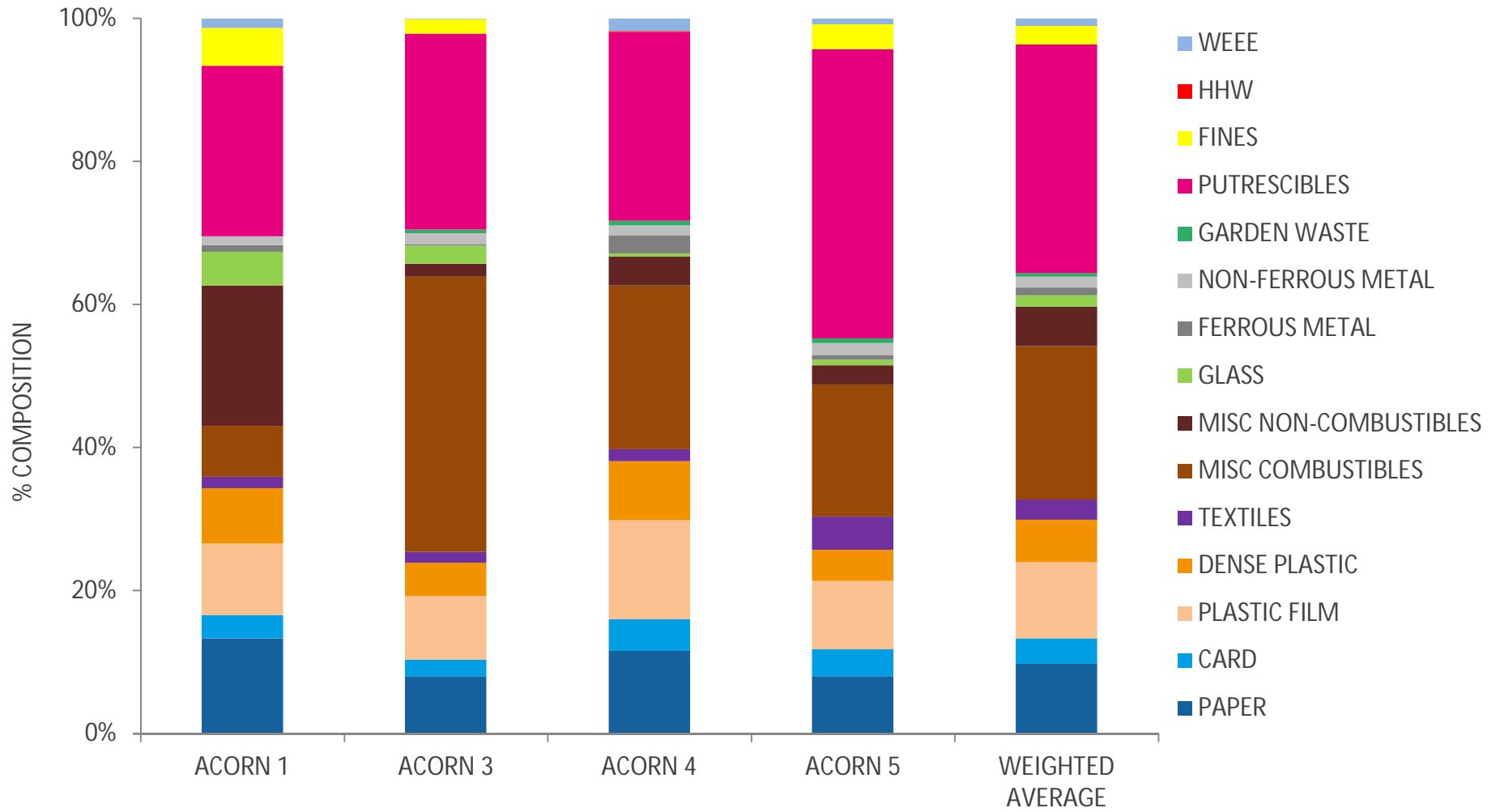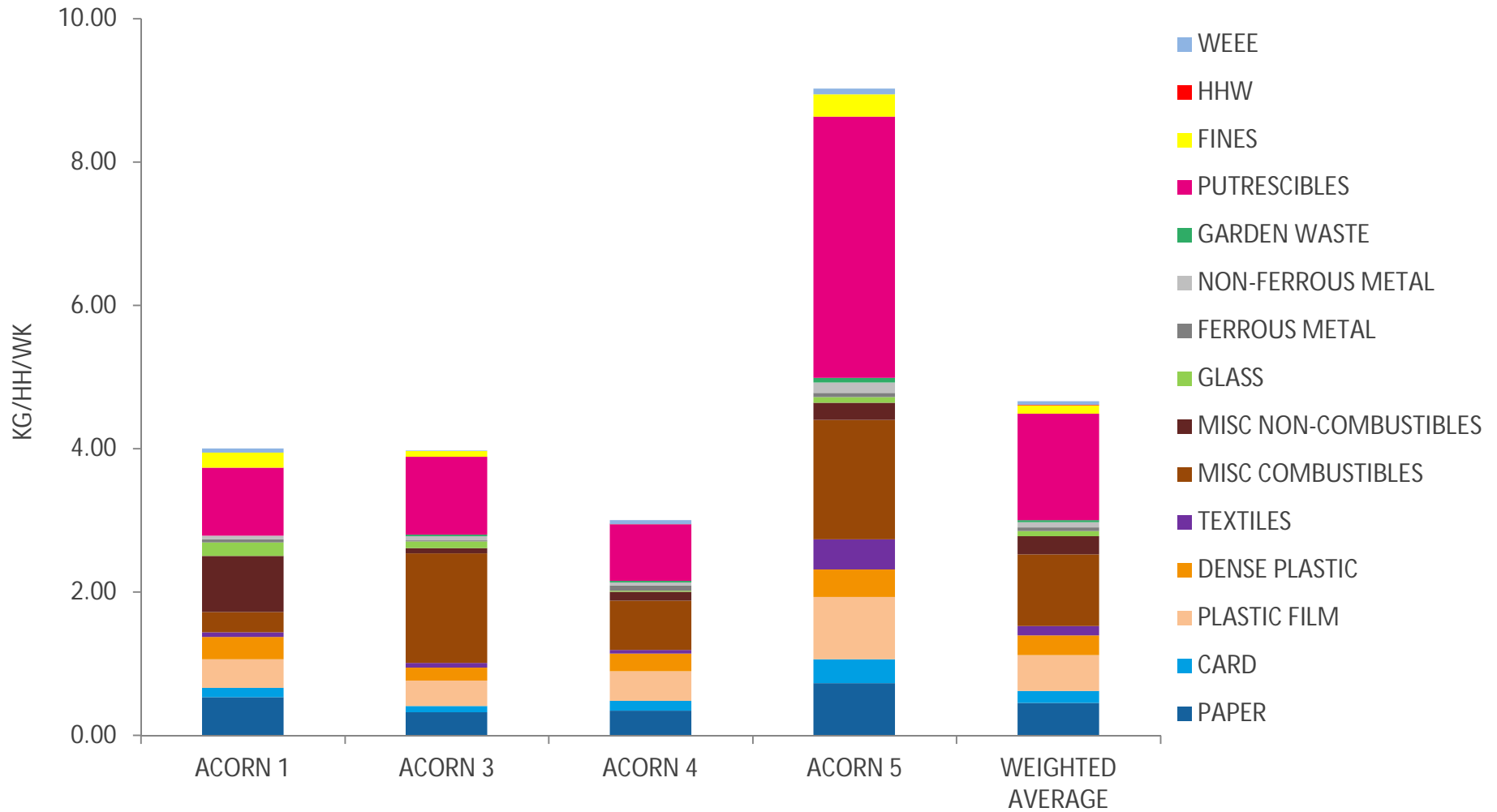
Organic Waste

Organic waste, which includes garden and food waste (putrescibles), formed the greatest weight concentration of the primary waste categories for all Acorns. Ranges seen were from 23.8% from Acorn 1 households to 41.1% in Acorn 5 households. Across Watford as a whole around 32.5% of all residual waste (1.5kg/hh/wk) is classified as organic waste. Food waste accounted for between 22.2% (Acorn 1) and 39.1% (Acorn 5) of residual waste. As a whole, around 30.5% of all residual waste (1.42kg/hh/wk) is classified as food waste. Currently Watford residents are able to recycle food waste at the kerbside using their green lidded bins. Residents from Acorn 5 placed the most food into their residual bins at 3.53kg/hh/wk.
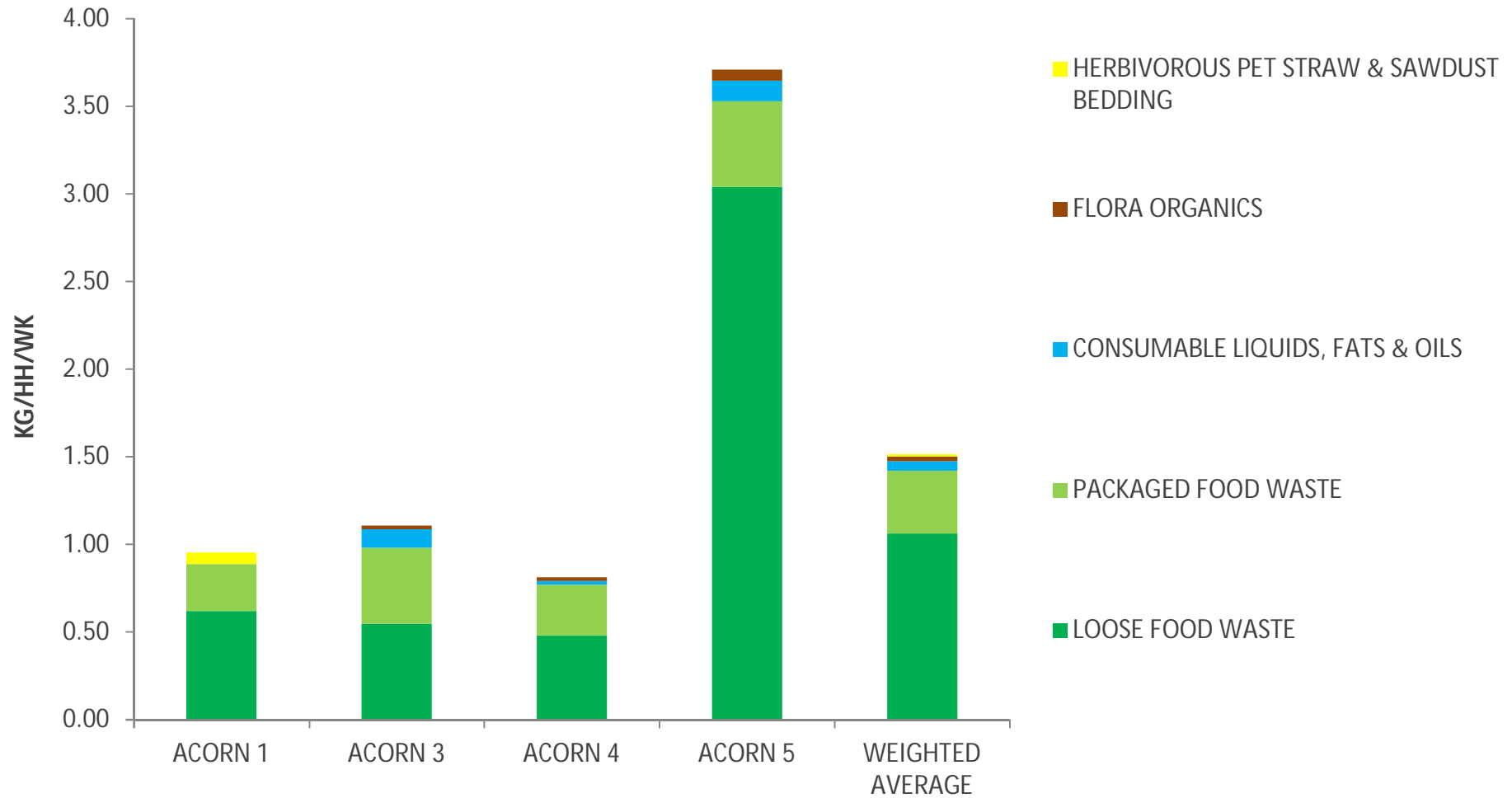
Food waste was further categorised as to whether it was avoidable (uneaten, unused or spoilt) or unavoidable (inedible by products such as shells, stones, skin etc). Overall around 47% of all food in the residual waste was deemed avoidable; this equates to 0.66kg/hh/wk. Around 53% of the avoidable food waste is due to packaged food which is therefore responsible for 25% of all the food in the residual bins.

Table 5: Levels of organic wastes within residual waste of each Acorn (kg/hh/wk)

RESIDUAL ORGANICS (KG/HH/WK)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
FLORA ORGANICS	0.00	0.02	0.02	0.06	0.03
SOIL & TURF	0.00	0.00	0.00	0.00	0.00
LOOSE FOOD WASTE	0.62	0.55	0.48	3.04	1.06
PACKAGED FOOD WASTE	0.27	0.43	0.29	0.49	0.36
HERBIVOROUS PET STRAW & SAWDUST BEDDING	0.07	0.00	0.00	0.00	0.01
CONSUMABLE LIQUIDS, FATS & OILS	0.00	0.10	0.02	0.12	0.06
KG/HH/WK ORGANICS	0.95	1.11	0.81	3.71	1.51
% ORGANICS	23.81%	27.89%	27.02%	41.07%	32.46%
KG/HH/WK FOOD WASTE	0.89	0.98	0.77	3.53	1.42
% FOOD WASTE	22.15%	24.70%	25.60%	39.09%	30.46%

Residents throughout Watford can also use green lidded bins to recycle garden waste at the kerbside. Levels of garden waste in residual bins were low, averaging just 0.6% or 0.03kg/hh/wk. All of this was due to recyclable garden vegetation. All samples had concentrations of garden waste below 1%.

Figure 5: Levels of organics within residual waste of each Acorn (kg/hh/wk)

Legend:
- HERBIVOROUS PET STRAW & SAWDUST BEDDING
- FLORA ORGANICS
- CONSUMABLE LIQUIDS, FATS & OILS
- PACKAGED FOOD WASTE
- LOOSE FOOD WASTE

Y-axis: KG/HH/WK (0.00 to 4.00)

X-axis categories: ACORN 1, ACORN 3, ACORN 4, ACORN 5, WEIGHTED AVERAGE

Paper

On average, Acorn 1 residents had the highest concentrations of this type of waste (13.3%), with Acorn 5 disposing of the most at 0.73kg/hh/wk. In comparison just 8.0% or 0.32kg/hh/wk of residual waste from Acorn 3 was due to paper based materials. Across Watford it was seen that around 9.7% or 0.45kg/hh/wk of residual waste consisted of discarded paper.

A proportion of this paper is available for recycling at the kerbside. Watford residents can use their blue lidded bins for recycling paper such as newspapers, junk mail, envelopes and directories. It was found that between 22.4% (Acorn 4) and 43.7% (Acorn 1) of paper could have been placed into recycling boxes as opposed to the residual bins.

When accounting for all of the various types of paper within the residual waste, it is seen that 28.6% of residual paper was recyclable which accounted for 2.8% of all the residual waste or 0.13kg/hh/wk.

Table 6 and Figure 6 show the amounts of the different forms of paper waste for each Acorn.

Table 6: Levels of paper wastes within residual waste of each Acorn (kg/hh/wk)

RESIDUAL PAPER	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
RECYCLABLE PAPER	0.23	0.09	0.08	0.18	0.13
NON-RECYCLABLE PAPER	0.30	0.23	0.27	0.54	0.32
KG/HH/WK TOTAL PAPER	0.53	0.32	0.35	0.73	0.45
% PAPER RECYCLABLE	43.7%	27.6%	22.4%	25.4%	28.6%

Figure 6: Levels of paper wastes within residual waste of each Acorn (kg/hh/wk)

Figure 6: Levels of paper wastes within residual waste of each Acorn (kg/hh/wk)

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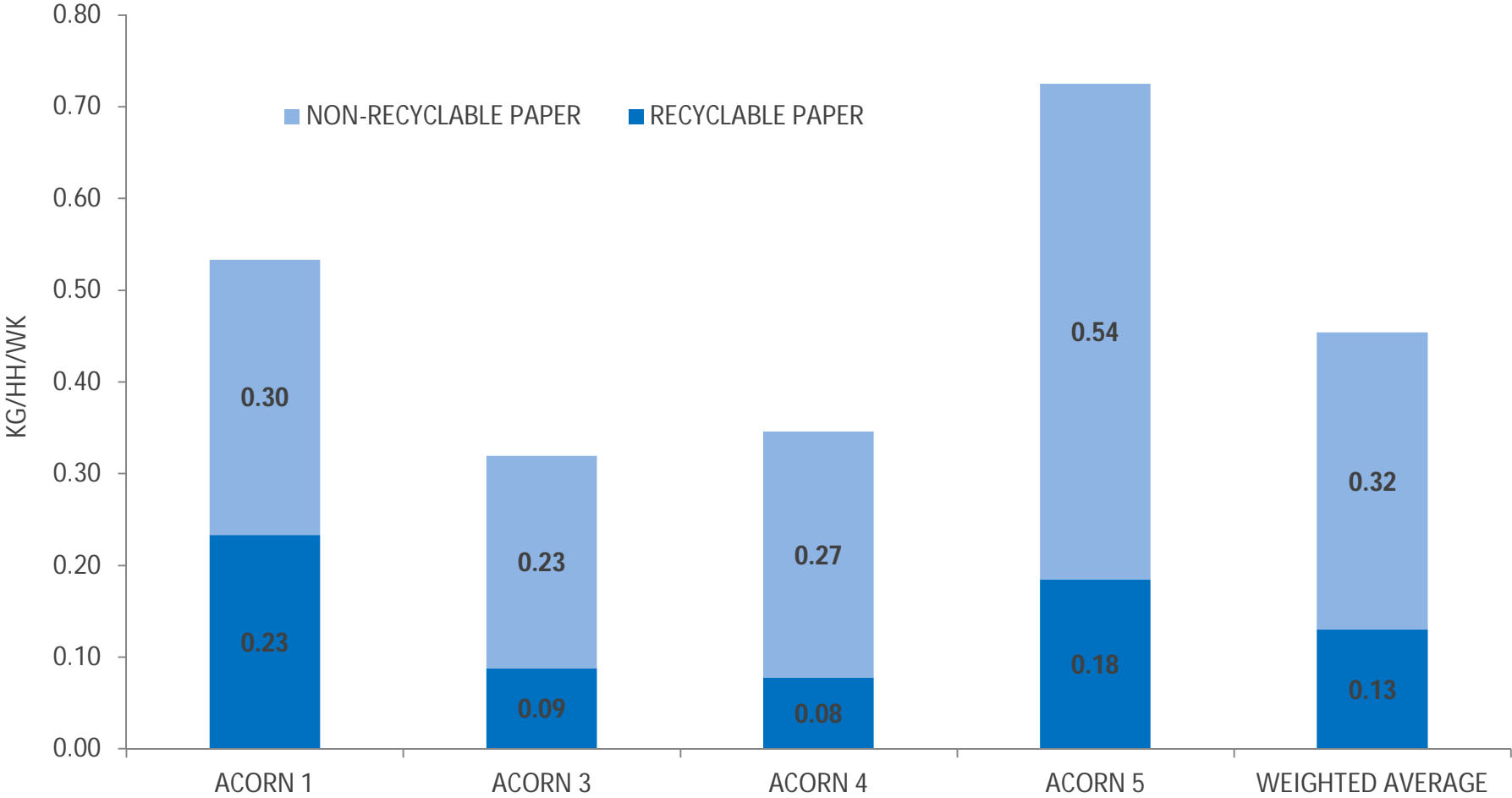
Card & Cardboard

On average, Acorn 4 residents had the highest concentrations of this type of waste (4.5%), with Acorn 5 disposing of the most at 0.34kg/hh/wk. In comparison 0.09kg/hh/wk of residual waste from Acorn 3 was due to card and cardboard based materials. Across Watford it was seen that around 3.6% or 0.17kg/hh/wk of residual waste consisted of discarded card and cardboard.

A proportion of this card & cardboard is available for recycling at the kerbside. Watford residents can recycle card and cardboard in (or alongside) their blue lidded bins. It was found that between 78.9% (Acorn 3) and 89.4% (Acorn 5) of card and cardboard could have been recycled rather than disposed of in residual bins. Across Watford, 84.5% of residual card and cardboard was compatible with recycling bins which accounted for 3.0% of all the residual waste or 0.14kg/hh/wk.

Table 7 and Figure 7 show the amounts of the different forms of card and cardboard waste for each Acorn.

When combining paper and card together it is estimated that 44% of that present in residual bins could have been recycled via kerbside recycling collections. This amounts to 5.8% of all the residual waste being collected – a total of 0.27kg/hh/wk.

Table 7: Levels of card wastes within residual waste of each Acorn (kg/hh/wk)

RESIDUAL CARD	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
RECYCLABLE THIN CARD	0.07	0.05	0.09	0.19	0.10
RECYCLABLE CORRUGATED CARDBOARD	0.03	0.01	0.01	0.05	0.02
BEVERAGE CARTONS	0.00	0.01	0.01	0.06	0.02
NON-RECYCLABLE CARD	0.02	0.02	0.02	0.04	0.03
KG/HH/WK TOTAL CARD & CARDBOARD	0.13	0.09	0.13	0.34	0.17
KG/HH/WK RECYCLABLE CARD & CARDBOARD	0.11	0.07	0.11	0.30	0.14
% CARD KERBSIDE RECYCLABLE	81.4%	78.9%	81.5%	89.4%	84.5%

Figure 7: Levels of card wastes within residual waste of each Acorn (kg/hh/wk)
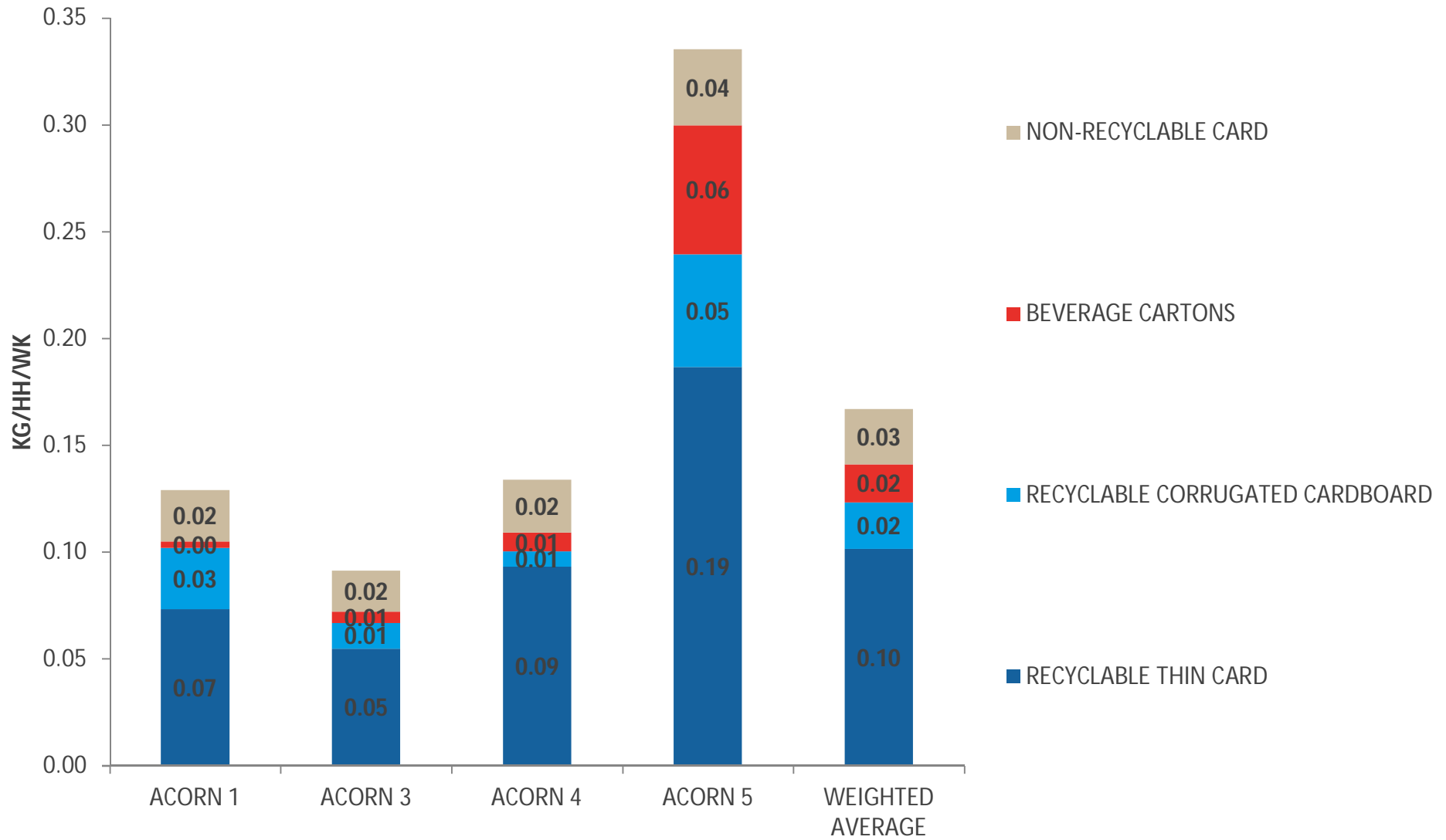
Plastics

In this sampling campaign average ranges for waste plastics were 13.5% from Acorn 3 households to 22.1% in the waste from Acorn 4 households. Watford residents currently recycle plastic bottles and selected containers as part of their dry recycling. Across the area as a whole, 16.6% of residual waste was classified as plastic which equates to 0.77kg/hh/wk. On the whole plastic material, although not heavy in itself, can produce large volumes of waste.

Figure 8 clearly shows the levels of recyclable plastics within the residual waste. On average, around 23.0% of the plastic waste present in the residual was recyclable, equating to 0.18kg/hh/wk.
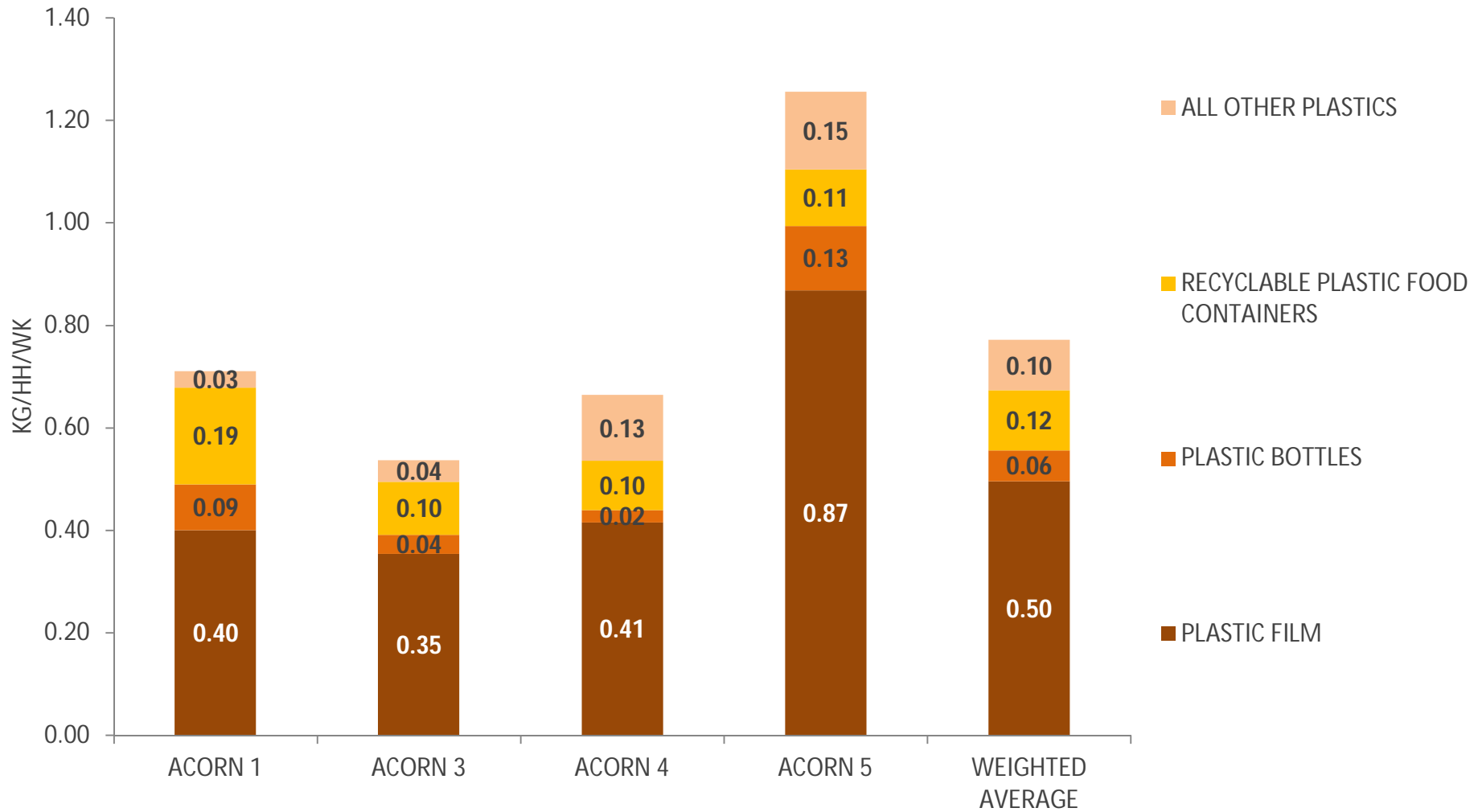
Plastic containers made up 66% of the recyclable plastics with bottles forming the remaining 34%.

Table 8 and Figure 8 show the amounts of the different forms of plastic waste found within the residual samples from each Acorn.

Table 8: Levels of plastics within residual waste of each Acorn (kg/hh/wk)

RESIDUAL PLASTICS	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
PLASTIC FILM	0.40	0.35	0.41	0.87	0.50
PLASTIC BOTTLES	0.09	0.04	0.02	0.13	0.06
RECYCLABLE PLASTIC FOOD CONTAINERS	0.19	0.10	0.10	0.11	0.12
ALL OTHER PLASTICS	0.03	0.04	0.13	0.15	0.10
KG/HH/WK TOTAL PLASTIC	0.71	0.54	0.66	1.26	0.77
KG/HH/WK RECYCLABLE PLASTIC	0.28	0.14	0.12	0.24	0.18
% PLASTIC RECYCLABLE	39.3%	26.1%	18.3%	18.8%	23.0%

Figure 8: Levels of plastics within residual waste of each Acorn (kg/hh/wk)

Legend:
- ALL OTHER PLASTICS
- RECYCLABLE PLASTIC FOOD CONTAINERS
- PLASTIC BOTTLES
- PLASTIC FILM

Category	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
ALL OTHER PLASTICS	0.03	0.04	0.13	0.15	0.10
RECYCLABLE PLASTIC FOOD CONTAINERS	0.19	0.10	0.10	0.11	0.12
PLASTIC BOTTLES	0.09	0.04	0.02	0.13	0.06
PLASTIC FILM	0.40	0.35	0.41	0.87	0.50

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Metals

In this sampling campaign average concentrations of residual metals were seen to be 1.7% total metal by weight from Acorn 3 households to 3.8% in the waste from Acorn 4 households, averaging 2.6% overall. Watford residents have access to a recycling collection of food and drink cans as well as aerosols and clean foil via their mixed recycling collection. The average weight of metals in the residual waste from Acorn 3 was 0.07kg/hh/wk rising to 0.21kg/hh/wk in Acorn 5.

A proportion of this metal waste is available for recycling at the kerbside. It was found that 47% of Acorn 4 metals were recyclable rising to 100% for the metals in Acorn 3 residual waste. Across Watford an average of 72.5% or 0.09kg/hh/wk of residual metal is classified as recyclable, this equates to 1.9% of all collected residual waste.

Less than half of residual metals were ferrous.

Table 9 and Figure 9 show the amounts of the different forms of metallic waste found within the samples from each Acorn. Food cans tend to require a degree of washing before being placed into recycling containers and as such are often less well diverted than cleaner drinks cans.

Table 9: Levels of metals within residual waste of each Acorn (kg/hh/wk)

RESIDUAL METALS	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
DRINK CANS	0.01	0.03	0.02	0.02	0.02
FOOD TINS & CANS	0.04	0.01	0.00	0.03	0.01
AEROSOLS	0.01	0.00	0.01	0.03	0.01
ALUMINIUM FOIL AND OTHER PACKAGING	0.03	0.03	0.03	0.09	0.04
OTHER NON-RECYCLABLE METALS	0.00	0.00	0.06	0.04	0.03
RECYCLABLE METALS	0.09	0.07	0.05	0.17	0.09
TOTAL METALS	0.09	0.07	0.12	0.21	0.12
% FERROUS	44.0%	12.4%	64.8%	27.6%	42.3%
% RECYCLABLE	98.0%	100.0%	47.4%	81.2%	72.5%

Figure 9: Levels of metals within residual waste of each Acorn (kg/hh/wk)
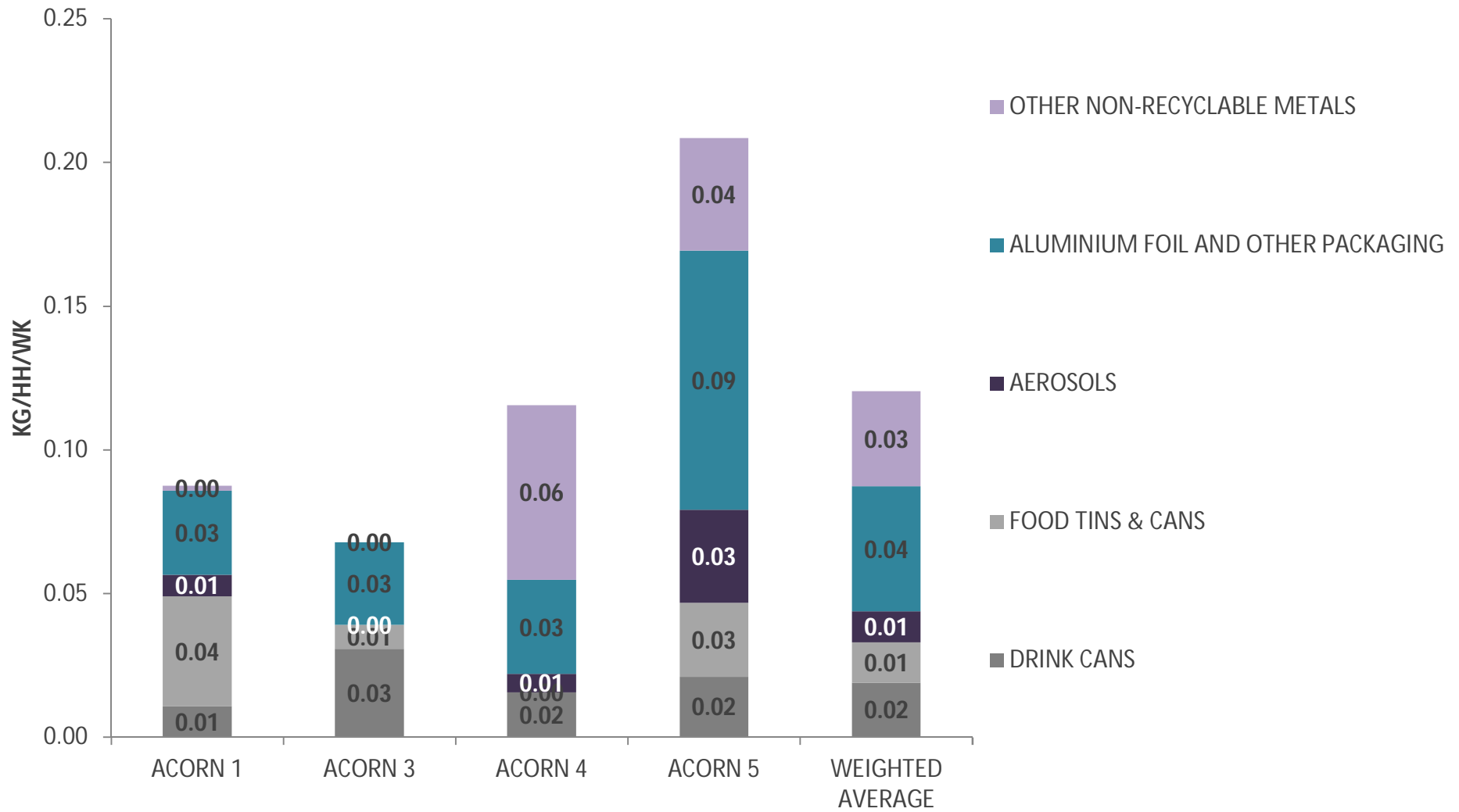
Glass

In this sampling campaign the average concentration of residual glass was seen to be 0.5% total glass by weight from Acorn 4 households, rising to 4.7% in the waste from Acorn 1 residual bins. Watford residents are able to recycle glass bottles and jars at the kerbside in their mixed recycling bins. The weight of glass in the residual waste from Acorn 4 was just 0.01kg/hh/wk rising to 0.10kg/hh/wk for Acorn 3. This represented a Borough wide average of 1.6% or 0.08kg/hh/wk.

A proportion of this glass consists of bottles and jars which could have been recycled rather than placed into residual bins. It was found that across Watford an average of 67.2% or 0.05kg/hh/wk of residual glass is classified as recyclable, this equates to 1.1% of all collected residual waste.

Overall, 79.9% of recyclable glass was clear, accounting for 0.04kg/hh/wk of residual waste. Over half of the clear glass was due to jars as opposed to bottles. Jars often need more cleaning than bottles and are generally less effectively recycled.

Table 10 and Figure 10 show the amounts of the different forms of glass waste found within the samples from each Acorn.

Table 10: Levels of glass within residual waste of each Acorn (kg/hh/wk)

RESIDUAL GLASS	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
GREEN GLASS	0.00	0.00	0.00	0.01	0.00
BROWN, BLUE, RED GLASS	0.02	0.00	0.00	0.02	0.01
CLEAR BOTTLES	0.00	0.06	0.00	0.03	0.02
CLEAR JARS	0.06	0.04	0.00	0.01	0.02
OTHER NON PACKAGING GLASS	0.11	0.00	0.01	0.00	0.02
KG/HH/WK TOTAL GLASS	0.19	0.10	0.01	0.07	0.08
KG/HH/WK RECYCLABLE GLASS	0.08	0.10	0.00	0.07	0.05
% RECYCLABLE	42.7%	100.0%	0.0%	100.0%	67.2%
% OF RECYCLABLE GLASS - CLEAR	77.6%	100.0%	N/A	55.0%	79.9%

Figure 10: Levels of glass within residual waste of each Acorn (kg/hh/wk)
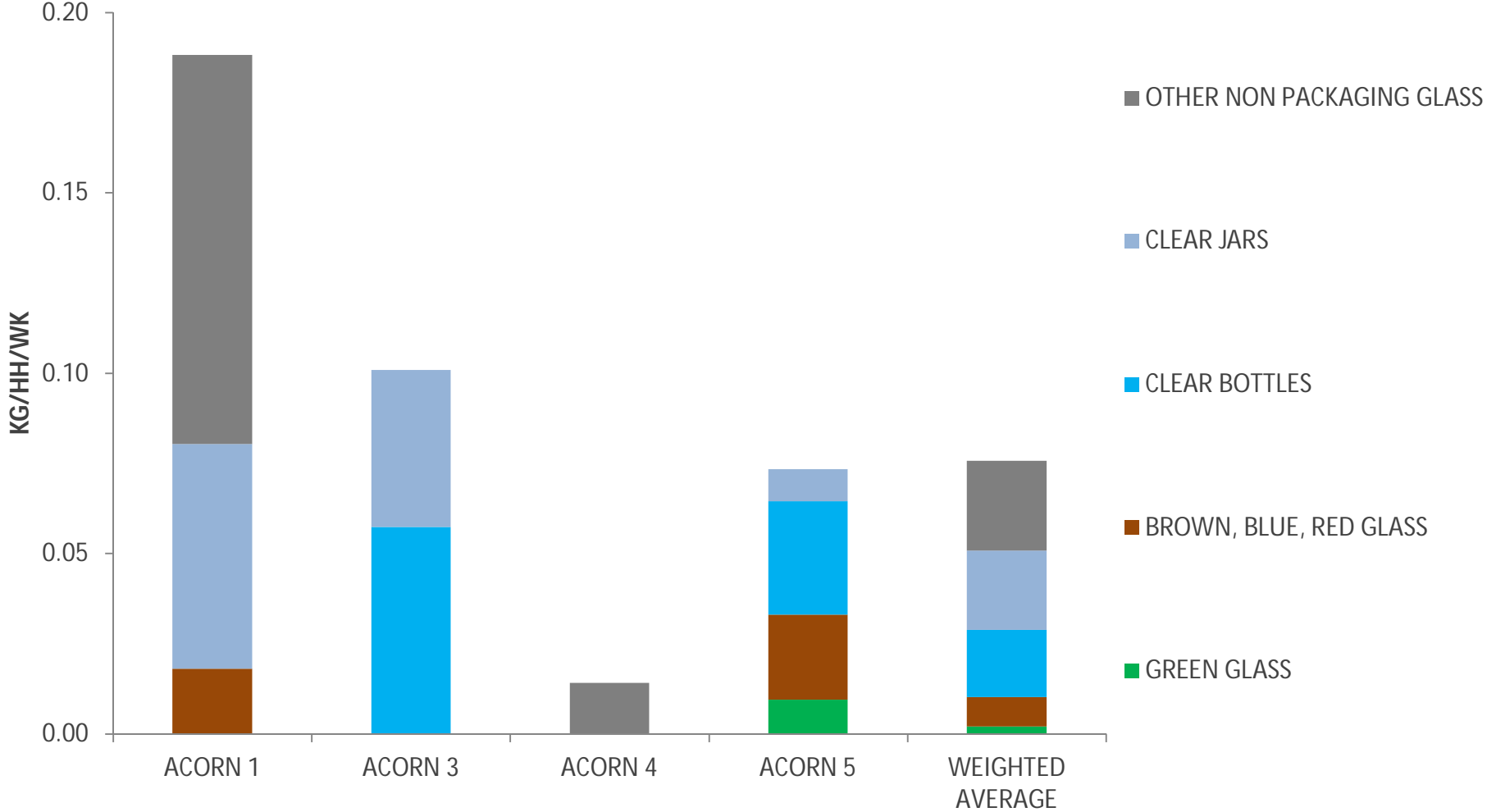
Other notable materials within the residual waste

Textiles - From the survey, around 4.6% of the residual waste from Acorn 5 was seen to consist of textiles, this compares with levels of 1.6% for all other samples.   The residual waste from Acorn 5 households contained the most textile waste at 0.42kg/hh/wk.

Watford households do not currently have provision to recyclable bagged textiles at the kerbside. Overall, an average of 2.9% or 0.13kg/hh/wk of residual waste across all households consisted of textile waste. Of the textiles present, around 55% were potentially recyclable and these accounted for 1.6% of the residual waste – 0.07kg/hh/wk.

Disposable Nappies & AHP (Absorbent Hygiene Products) -The profile of this type of waste has increased in recent years and nappy levels within the residual bins of households with babies can be extremely high. In this survey, the concentrations of disposable nappies and AHP averaged 9.7% or 0.45kg/hh/wk. In Acorn 3 samples the average was 3.5% or 0.14g/hh/wk with levels of over 12.5% recorded for Acorn 4 and 5 residual waste. In Acorn 5 around 1.13kg/hh/wk of disposable nappies are being disposed of. Generally, a small number of individual households are largely responsible for increasing this type of waste collected from a sample area.

Inert rubble – This type of waste is generally one of the densest materials placed into residual bins. Although more suited for disposal at HWRC's small amounts mixed with general residual waste are to be expected. Often it is seen that a small number of individual houses may place increased levels of construction / clearance type waste into their bins. On average 5.5% or 0.25kg/hh/wk consisted of mixed non-combustible waste. Around 19.6% (0.8kg/hh/wk) of the residual waste in the Acorn 1 sample consisted of these inert materials compared with 1.8% for the Acorn 3 residual waste.

Hazardous waste and WEEE – On average just 1.1% or 0.05kg/hh/wk of residual waste consisted of hazardous waste and WEEE . Levels were highest at 2.0% for the Acorn 4 sample.

Potential recyclability of the residual waste

The overall recyclability of the residual waste relates to all the items present that could have been accepted into the kerbside recycling schemes currently running in Watford. Results from the survey showed that the overall recyclability of the residual waste was highest in Acorn 5 households at 50.5%, and lowest in Acorn 3 at 37.1%. Across Watford it is expected that 43.9% of all residual waste being disposed of is recyclable at the kerbside.

Overall around 31.3% of residual waste was compatible with food and garden collections with a further 12.6% acceptable in mixed recycling bins

Table 11: Proportion of residual waste currently recyclable relative to current schemes (%)

% RECYCLABLES IN RESIDUAL WASTE	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
MIXED DRY RECYCLABLES	19.57%	11.81%	12.07%	10.66%	12.59%
FOOD & GARDEN RECYCLABLES	23.81%	25.25%	26.29%	39.79%	31.28%
TOTAL RECYCLABLE	43.38%	37.06%	38.36%	50.45%	43.87%

In terms of the amount of recyclables disposed of it is seen that Acorn 5 householders place 4.55kg/hh/wk of materials in residual bins that could be placed into the various kerbside recycling containers. This is far higher than any of the other samples which are between 1.2kg/hh/wk and 1.7kg/hh/wk. Across Watford around 2.04kg/hh/wk of recyclable material is being disposed of in the residual waste.

**Table 12: Kg/hh/wk of residual waste currently recyclable relative to current schemes**

KG/HH/WK RECYCLABLES IN RESIDUAL WASTE	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
MIXED DRY RECYCLABLES	0.78	0.47	0.36	0.96	0.59
FOOD & GARDEN RECYCLABLES	0.95	1.00	0.79	3.59	1.46
TOTAL RECYCLABLE	1.74	1.47	1.15	4.55	2.04

Figure 12 clearly shows the levels of residual materials currently collectable in the recycling collections available in Watford. Different households were seen to dispose of differing levels of recyclable materials, both in terms of volume and composition (Table 15).

Table 13: Kg/hh/wk of residual waste potentially recyclable relative to Acorn (Kg/hh/wk)

KG/HH/WK MATERIALS WITHIN RESIDUAL WASTE	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
RECYCLABLE PAPER	0.23	0.09	0.08	0.18	0.13
RECYCLABLE CARD & CARDBOARD	0.11	0.07	0.11	0.30	0.14
RECYCLABLE PLASTIC BOTTLES	0.09	0.04	0.02	0.13	0.06
RECYCLABLE PLASTIC CONTAINERS	0.19	0.10	0.10	0.11	0.12
RECYCLABLE GLASS	0.08	0.10	0.00	0.07	0.05
RECYCLABLE METALS	0.09	0.07	0.05	0.17	0.09
RECYCLABLE FOOD WASTE	0.89	0.98	0.77	3.53	1.42
RECYCLABLE GARDEN WASTE	0.00	0.02	0.02	0.06	0.03
RECYCLABLE PET BEDDING	0.07	0.00	0.00	0.00	0.01
TOTAL RECYCLABLE	1.74	1.47	1.15	4.55	2.04

Figure 11: Kg/hh/wk of residual waste potentially recyclable relative to Acorn (Kg/hh/wk)
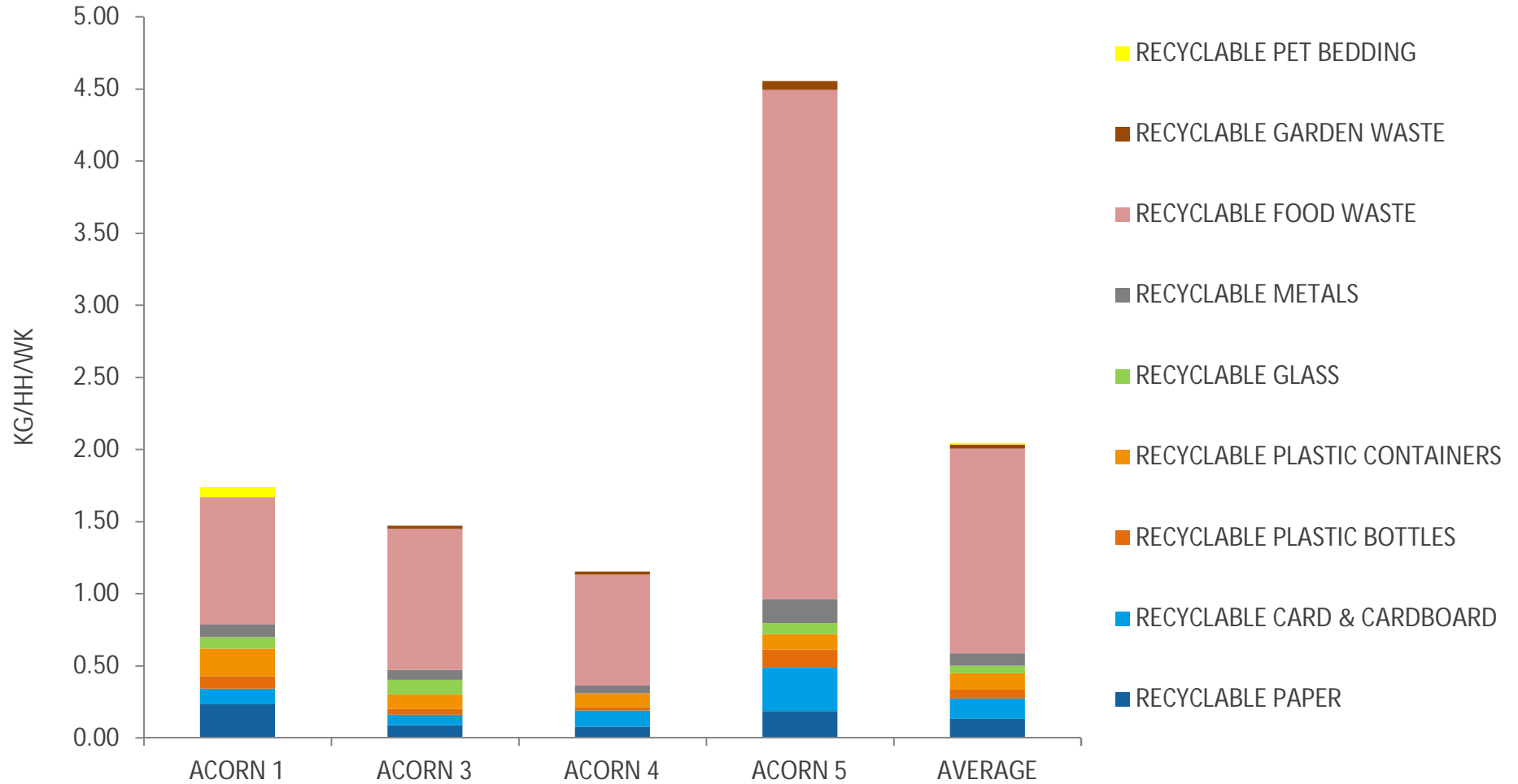
Dry recycling waste

Set out rates and waste generation

Table 14 and Figure 12 highlight the set out rates for mixed kerbside recycling (blue lidded bins) observed at the time waste was collected for compositional analysis. Table 15 and Figure 13 show the amount of this recycling waste generated in kg/hh/wk. The same houses were sampled as those included in the residual survey above. As for the residual waste analysis, the overall amount of waste in kilograms per household per week is derived from the number of households who could set out waste and not just those that are participating. These aggregated figures for the recycling waste are shown in tables and figures with additional information relating to individual household samples given where relevant.

An average of 63.6% of households across the Watford samples set out blue lidded recycling bins for collection. This ranged between 50% for Acorn 4 up to 82.5% for Acorn 1.

Table 14: Average Set Out for kerbside recycling waste (%)

% SET OUT RATE	MIXED RECYCLING
ACORN 1	82.5%
ACORN 3	66.7%
ACORN 4	50.0%
ACORN 5	70.7%
WEIGHTED AVERAGE	63.6%

An average of 3.69kg/hh/wk of mixed recycling is being generated, this ranged between 3.05kg/hh/wk for Acorn 5 up to 4.09kg/hh/wk for Acorn 3.   Solely considering presented bins the average level is 5.80kg/hh/wk.

Table 15: Average Kerbside Recycling generation rates (kg/hh/wk)

ACORN	OVERALL KG/HH/WK	KG/HH/WK PER PRESENTED BIN
ACORN 1	3.88	4.70
ACORN 3	4.09	6.14
ACORN 4	3.75	7.50
ACORN 5	3.05	4.31
WEIGHTED AVERAGE	3.69	5.80

Figure 12: Average Set Out for mixed recycling waste (%)
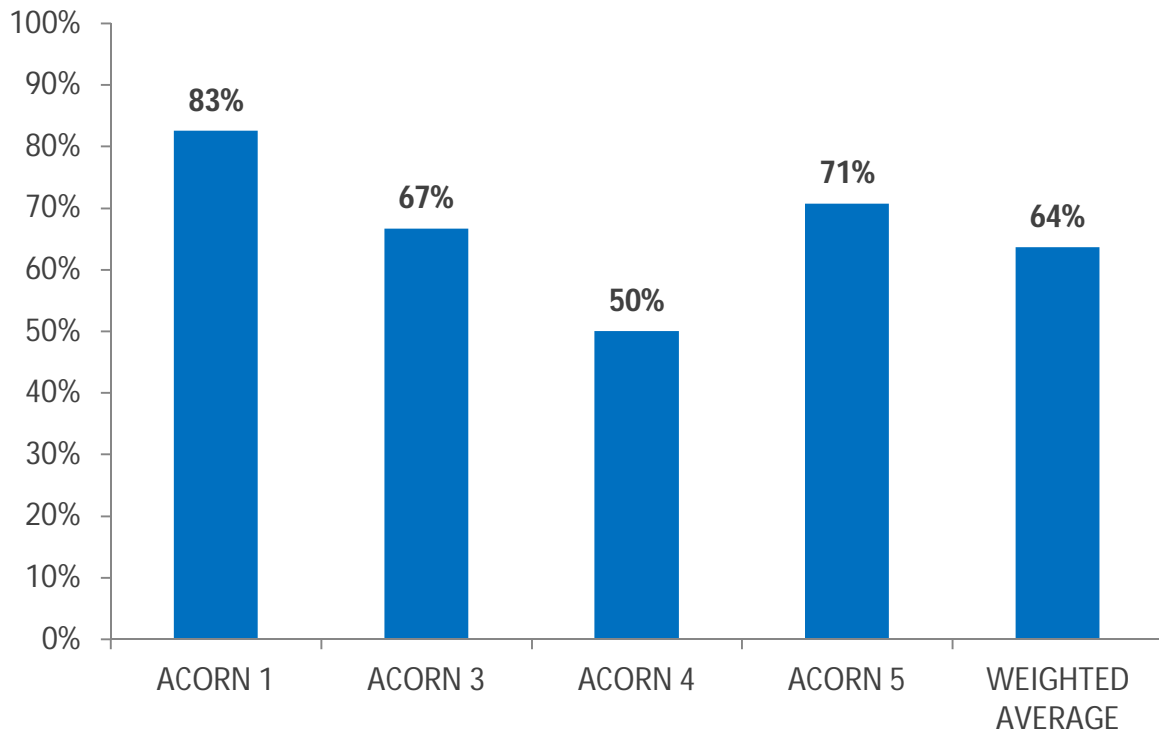
Figure 13: Average kerbside recycling waste generation rates (kg/hh/wk)

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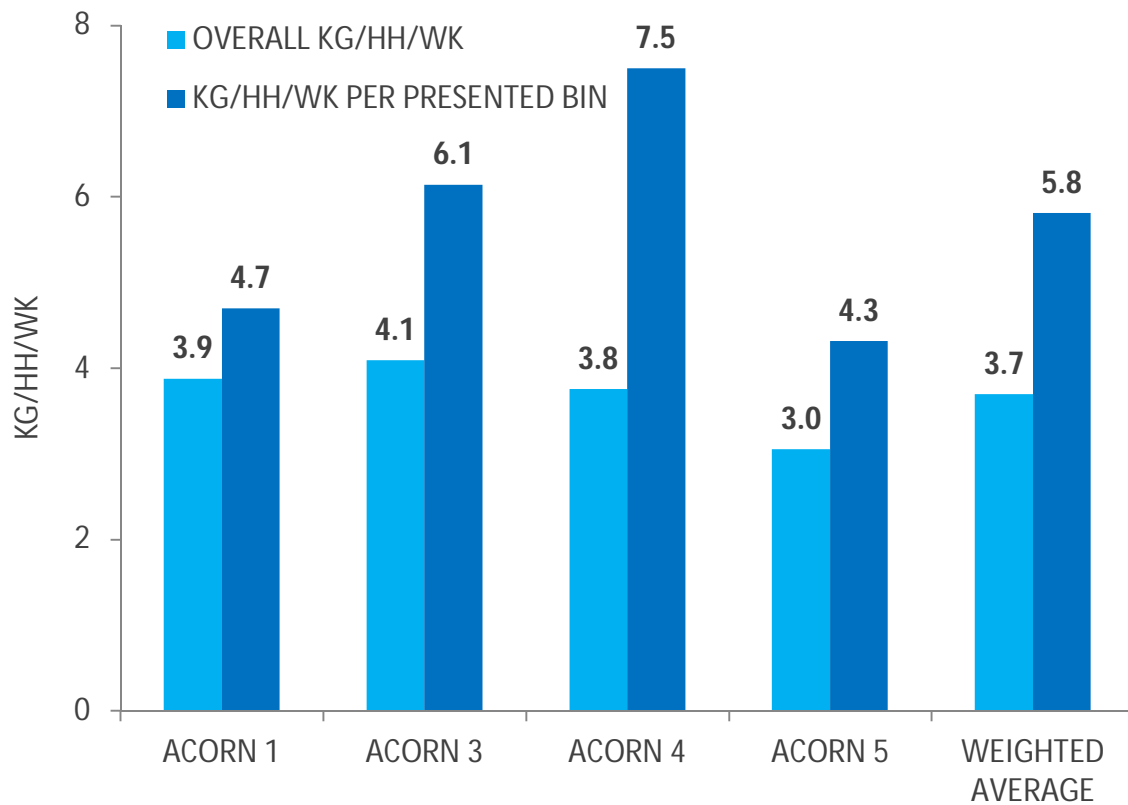
Compositional analysis of mixed recycling bins

This section looks at average amounts and composition of the blue lid recycling bins presented by households sampled throughout Watford. Hand sorting of the recycling waste gave concentration by weight figures for the fifteen main categories of waste as well as the more detailed sub-categories. Results can again be expressed in terms of percentage concentration and kg/hh/wk for individual samples and in relation to the household Acorn type surveyed. Table 16 and Figure 14 show recycling data in terms of percentage composition with Table 17 and Figure 15 showing generation rates for major materials in kg/hh/wk across all households in each sample area.

As residual waste will contain a proportion that is classified as recyclable; then recycling waste will contain a faction that is deemed to contamination. That is to say that it is not compatible with the materials currently acceptable to the recycling container it is placed into.

Table 16: Composition of mixed recycling (% concentration) by Acorn

MIXED RECYCLING (%)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
RECYCLABLE PAPER	35.13%	35.86%	29.29%	8.74%	28.30%
RECYCLABLE CARD & CARDBOARD	36.28%	29.62%	36.36%	34.71%	34.50%
RECYCLABLE PLASTIC BOTTLES	4.80%	4.60%	5.34%	14.80%	6.72%
RECYCLABLE PLASTIC CONTAINERS	0.47%	4.01%	2.42%	1.09%	2.19%
RECYCLABLE GLASS	13.48%	21.76%	22.19%	18.46%	19.81%
RECYCLABLE METALS	2.13%	0.73%	2.89%	5.48%	2.70%
TOTAL MIXED RECYCLABLES	92.30%	96.57%	98.49%	83.29%	94.23%
TOTAL CONTAMINATION	7.70%	3.43%	1.51%	16.71%	5.77%

Table 17: Composition of mixed recycling (kg/hh/wk) by Acorn

MIXED RECYCLING (KG/HH/WK)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
RECYCLABLE PAPER	1.36	1.47	1.10	0.27	1.05
RECYCLABLE CARD & CARDBOARD	1.41	1.21	1.36	1.06	1.27
RECYCLABLE PLASTIC BOTTLES	0.19	0.19	0.20	0.45	0.25
RECYCLABLE PLASTIC CONTAINERS	0.02	0.16	0.09	0.03	0.08
RECYCLABLE GLASS	0.52	0.89	0.83	0.56	0.73
RECYCLABLE METALS	0.08	0.03	0.11	0.17	0.10
TOTAL MIXED RECYCLABLES	3.58	3.95	3.69	2.54	3.48
TOTAL CONTAMINATION	0.30	0.14	0.06	0.51	0.21

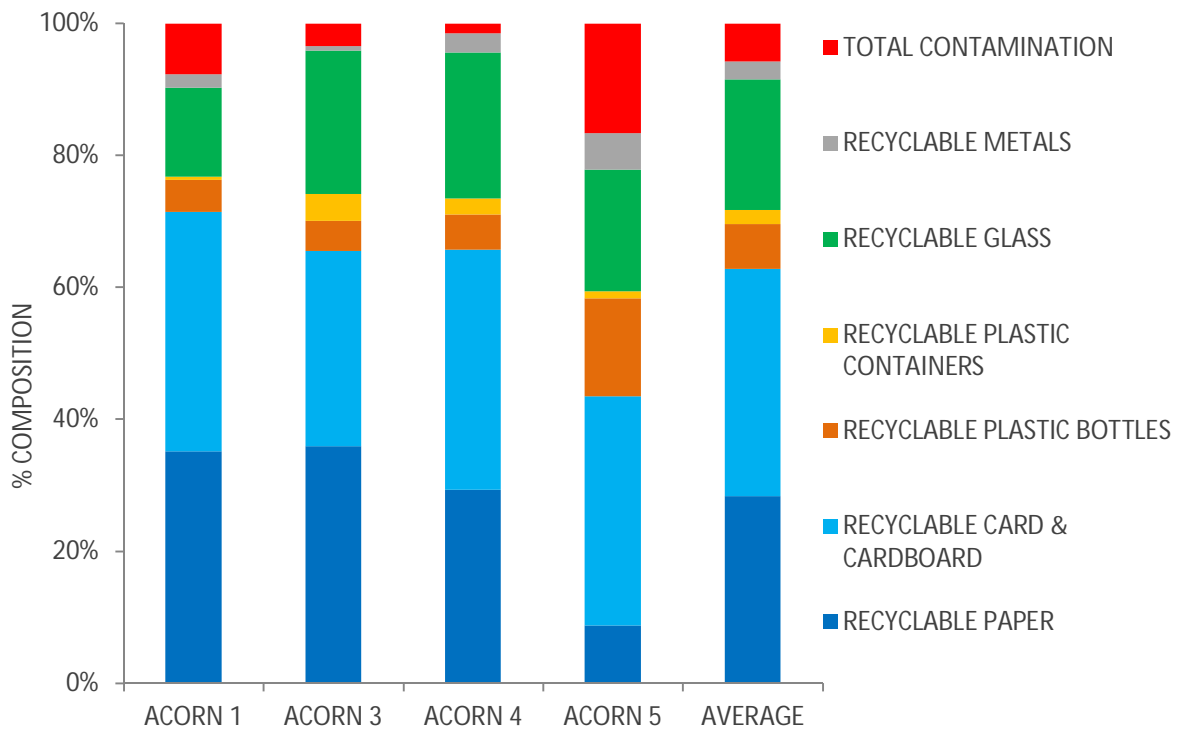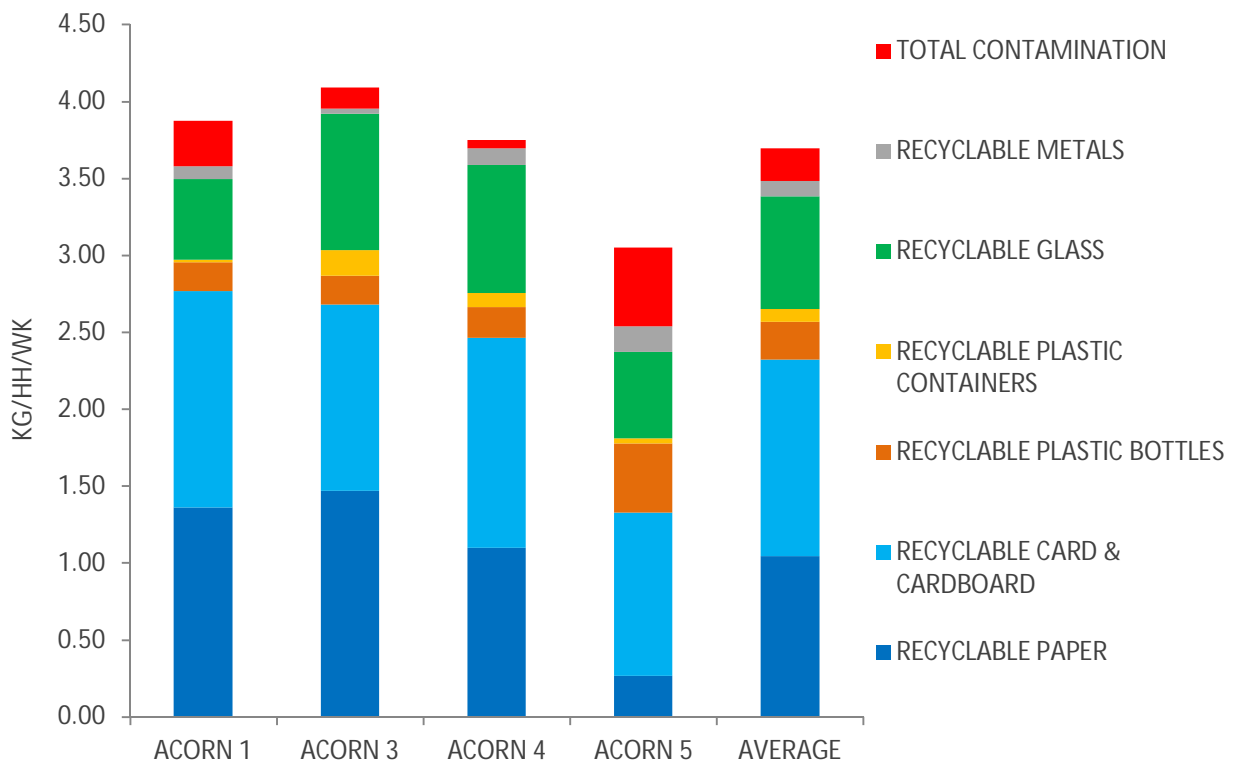## Figure 14: Composition of mixed recycling (%) by Acorn

Figure 15: Level of mixed recycling (kg/hh/wk) by Acorn

This section looks in more detail at the individual materials placed out for mixed recycling collections and highlights the effectiveness with which this scheme is capturing these items. Looking at the relationship between the residual and recycling waste streams presented will additionally give indications as to the overall diversion being achieved in the Watford samples.

Table 18 summarises the capture rates seen for the range of materials collected in mixed recycling bins. These figures are calculated by determining the distribution of recyclables across all waste streams for all households surveyed.

It can be seen that households are recycling 89% of their recyclable paper and 90% of their recyclable card and cardboard using their blue lidded bins.

Whereas 80% of plastic bottles are being recycled, just over 40% of recyclable plastic tubs, pots and trays are captured.

Glass bottles and jars are the most effectively recycled material with 93.5% placed into recycling bins.

Just over half (53%) of recyclable metals are captured.

Table 18: Summary table for material capture rates (%) mixed recycling

| % CORRECTLY RECYCLED	ACORN 1	ACORN 3	ACORN 4	ACORN 5	AVERAGE
RECYCLABLE PAPER	85.39%	94.35%	93.42%	59.10%	88.95%
RECYCLABLE CARD & CARDBOARD	93.05%	94.38%	92.60%	77.93%	90.03%
RECYCLABLE PLASTIC BOTTLES	67.43%	83.36%	88.82%	78.21%	80.39%
RECYCLABLE PLASTIC CONTAINERS	8.84%	61.47%	47.39%	23.21%	40.52%
RECYCLABLE GLASS	86.67%	89.83%	100.00%	88.47%	93.51%
RECYCLABLE METALS	49.04%	30.68%	66.47%	49.69%	53.40%
TOTAL MIXED RECYCLABLES	82.05%	89.39%	90.96%	72.51%	85.54%

Paper Capture

Acorn 3 residents captured the highest proportion of their recyclable paper with 94.4% correctly being recycled in blue lidded bins. Acorn 1 households also generated the most recyclable paper at 1.59kg/hh/wk. Residents in Acorn 5 areas captured the least at 59.1%, also disposing of the smallest amount at 0.45kg/hh/wk.

Across Watford it is estimated that 1.18kg/hh/wk of recyclable paper compatible with recycling collections is generated with around 89% being correctly recycled.

There are many different forms of paper and therefore decisions have to be made by residents as to whether a particular piece is to go into the recycling or residual waste.   In all sample areas, the majority of all recyclable forms of paper are being correctly diverted in each sample area.   There is, however, around 0.13kg/hh/wk of potentially recyclable paper not disposed of in recycling bins. Figure 16 shows the distribution of recyclable paper throughout the residual and recycling waste by Acorn category.

Figure 16: Distribution of recyclable paper within residual and recycling samples (kg/hh/wk)
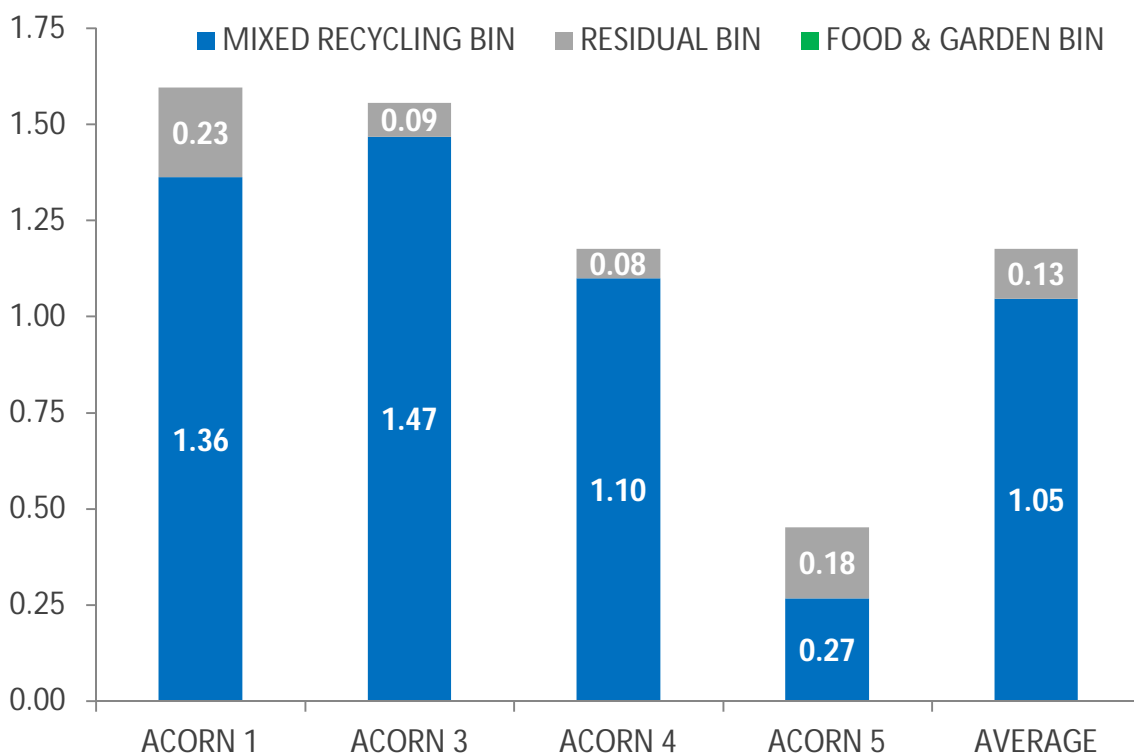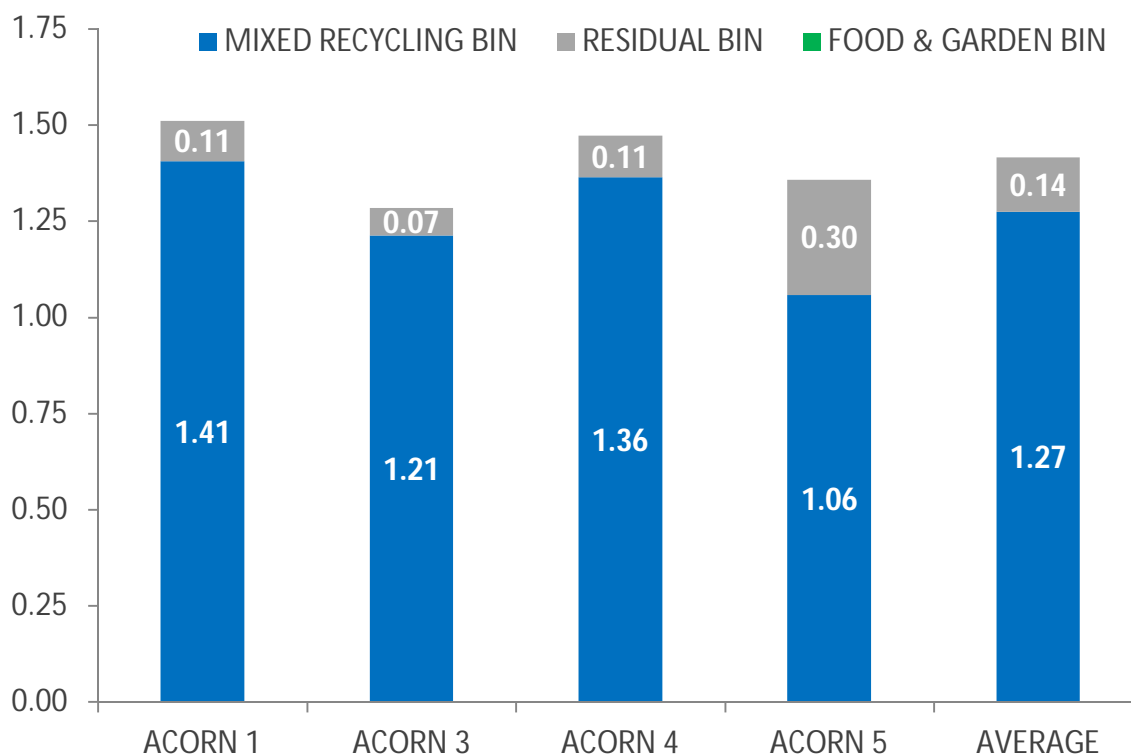
Card & Cardboard Capture

Acorn 3 residents captured the highest proportion of their recyclable card & cardboard with 94.4% correctly being recycled. Residents in Acorn 5 areas captured the least at 77.9% with Acorn 3 generating the lowest amount of recyclable card & cardboard at 1.30kg/hh/wk. Across Watford it is estimated that 1.42kg/hh/wk of recyclable card & cardboard is generated with around 90% being correctly placed into (or alongside) blue lidded recycling bins.

There are many different forms of card & cardboard and therefore decisions have to be made by residents as to whether a particular piece is to go into the recycling or residual waste. The majority of all recyclable forms of card & cardboard are being correctly diverted by the residents surveyed although there is around 0.14kg/hh/wk of potentially recyclable card & cardboard not being recycled with the majority in the residual bins. Results from this survey indicated that corrugated cardboard is recycled most efficiently with 97% captured. In comparison 80% of thin card is recycled along with 67% of Tetrapak cartons. Figure 17 shows the distribution of recyclable card & cardboard throughout the residual and recycling waste by Acorn category.

Figure 17: Distribution of recyclable card within residual and kerbside recycling samples (kg/hh/wk)
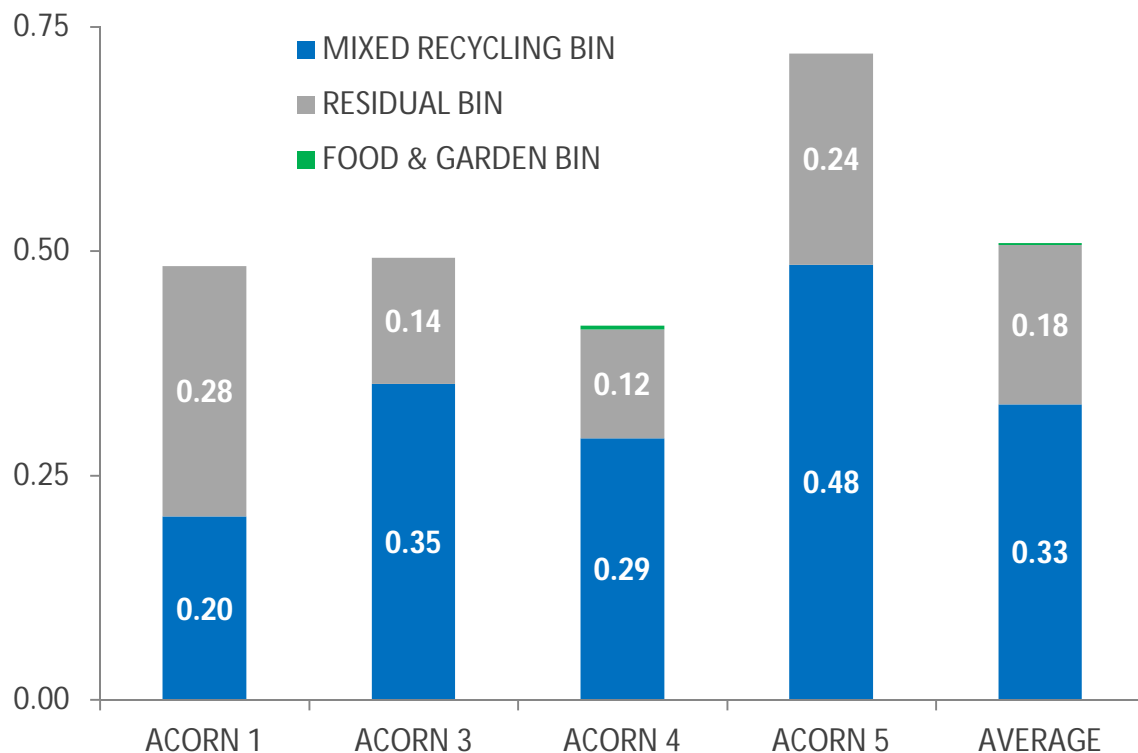
Plastics Capture

Acorn 3 residents captured the highest proportion of their recyclable plastics with 71.5% correctly being recycled. Acorn 5 households generated the most at 0.72kg/hh/wk of this material. Acorn 1 captured the lowest proportion at 42.3%. Across Watford it is estimated that 0.51kg/hh/wk of recyclable plastics are generated with around 64.7% being correctly placed into recycling bins

There are many different forms of plastic waste and therefore decisions have to be made by residents as to whether a particular piece is to go into the recycling or residual waste. The majority of all recyclable forms of plastic are being correctly diverted by most residents surveyed, however, 0.33kg/hh/wk remains unrecycled and is mainly in residual bins.

Results from this survey indicated that plastic bottles are recycled most efficiently with 80% captured. Ranges were 67% for Acorn 1 up to 88% for Acorn 4. In contrast just 40.5% of recyclable tubs, pots and trays were captured. Acorn 3 were the only sample to recycle the majority at 61.5% with Acorn 1 capturing less than 9%.

Figure 18: Distribution of recyclable plastics within residual and kerbside recycling samples (kg/hh/wk)

Metals Capture

Acorn 4 residents captured the highest proportion of their recyclable metals with 66.5% correctly being recycled. All other sample areas capture was between 31% and 50% with Acorn 5 generating the most at 0.34kg/hh/wk. On average, 53.4% of all recyclable metals are being correctly diverted by Watford residents sampled with around 0.19kg/hh/wk being generated.

The majority of all recyclable forms of metal are being correctly diverted by most residents surveyed with 0.10kg/hh/wk in residual bins. Results from this survey indicated that food tins are recycled most efficiently with 82% correctly captured. In comparison 61% of drink cans are recycled along with 39% of aerosols and just 4% of foil and other packaging. Figure 19 shows the distribution of recyclable metals throughout the residual and recycling waste by Acorn category.

Figure 19: Distribution of recyclable metals within residual and kerbside recycling samples (kg/hh/wk)
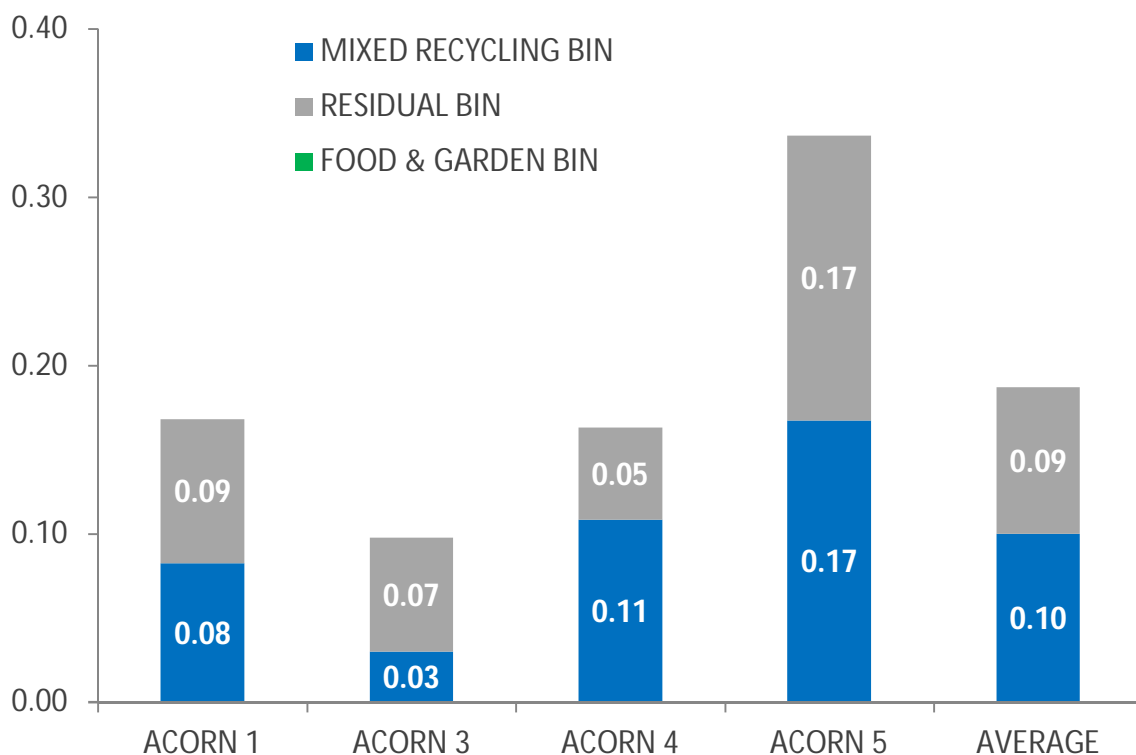
Glass Capture

Acorn 4 residents captured the highest proportion of their recyclable glass with 100% correctly being recycled, while residents from Acorn 1 captured 87%. Acorn 3 users produced the most recyclable glass in their combined kerbside waste at 0.99kg/hh/wk compared with 0.60kg/hh/wk from Acorn 1. On average, 93.5% of all recyclable glass is being correctly diverted by Watford residents sampled with around 0.78kg/hh/wk being generated.

The majority of all recyclable forms of glass are being correctly diverted by the residents surveyed with 0.05kg/hh/wk of in the residual waste. Results from this survey indicated that glass bottles are recycled most efficiently with 95% correctly captured compared with 85% of glass jars. Whereas bottles tend mainly to contain liquids that leave the bottle clean once empty; jars often contain sauces and preserves etc. These require cleaning once empty which often impacts on the efficiency of recycling. Figure 20 shows the distribution of recyclable glass throughout the residual and kerbside recycling waste.

Figure 20: Distribution of recyclable glass within residual and kerbside recycling samples (kg/hh/wk)
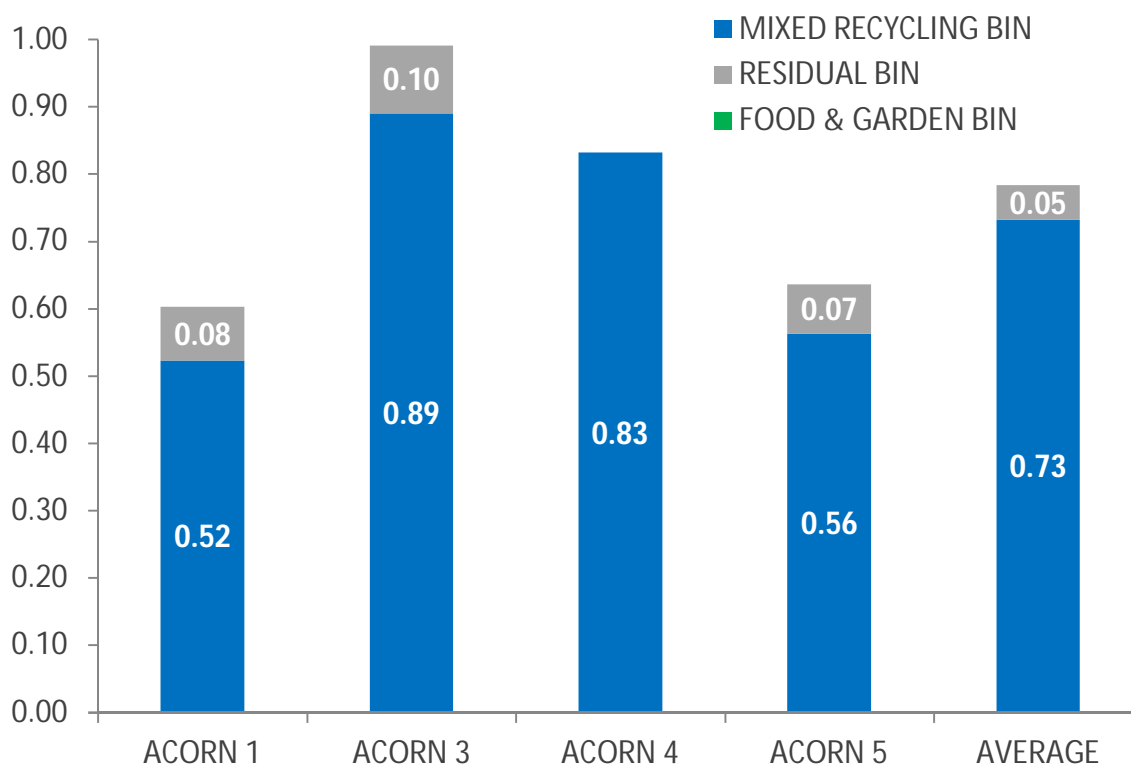
Recycling Contamination

Table 19 shows that on average 0.21kg/hh/wk of the items present in recycling bins are made up of contamination. This equates to around 5.8%. This section looks to breakdown the amounts and concentrations of various contaminants being placed into the recycling in Watford.

Some forms of contamination may be due to residents' lack of knowledge in relation to the recycling scheme. For example, a householder may believe anything metallic is acceptable with tins and cans. Other contamination will be formed from waste that is totally unrelated to the materials collected (i.e. disposable nappies, wood or food waste). Table 19 and Figure 21 show the amounts of contamination materials recovered from the recycling bins

Across the samples the collected recycling contained between 0.06kg/hh/wk, 1.5% (Acorn 4) and 0.51kg/hh/wk, 16.7% (Acorn 5) of contamination.

Table 19: Unacceptable materials within in the mixed recycling bins (kg/hh/wk)

CONTAMINATION (KG/HH/WK)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
NON-RECYCLABLE PAPER & CARD	0.02	0.08	0.04	0.07	0.05
NON-RECYCLABLE PLASTICS	0.01	0.03	0.02	0.10	0.04
NON-RECYCLABLE METALS	0.00	0.03	0.00	0.00	0.01
NON-RECYCLABLE GLASS	0.10	0.00	0.00	0.00	0.02
LIQUIDS	0.10	0.00	0.00	0.19	0.06
FOOD & GARDEN WASTE	0.04	0.00	0.00	0.11	0.03
ALL OTHER MATERIALS	0.03	0.00	0.00	0.05	0.02
TOTAL CONTAMINATION	0.30	0.14	0.06	0.51	0.21

Table 20: Breakdown of mixed recycling bin contaminants (% of contamination)

MIXED RECYCLING CONTAMINATION (%)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
NON-RECYCLABLE PAPER & CARD	0.58%	2.07%	0.95%	2.34%	1.38%
NON-RECYCLABLE PLASTICS	0.29%	0.68%	0.56%	3.16%	0.99%
NON-RECYCLABLE METALS	0.00%	0.67%	0.00%	0.00%	0.15%
NON-RECYCLABLE GLASS	2.53%	0.00%	0.00%	0.08%	0.49%
LIQUIDS	2.46%	0.00%	0.00%	6.07%	1.52%
FOOD & GARDEN WASTE	1.12%	0.00%	0.00%	3.49%	0.82%
ALL OTHER MATERIALS	0.72%	0.00%	0.00%	1.56%	0.41%
TOTAL CONTAMINATION	7.70%	3.43%	1.51%	16.71%	5.77%

Figure 21: Breakdown of contamination materials present within mixed recycling bins (kg/hh/wk).
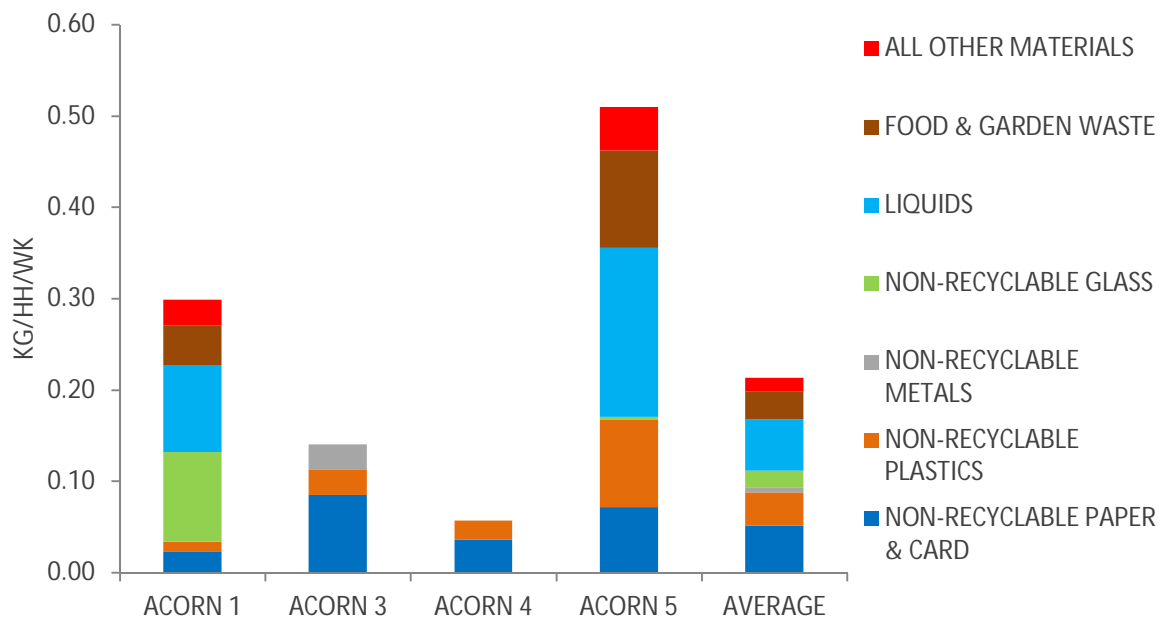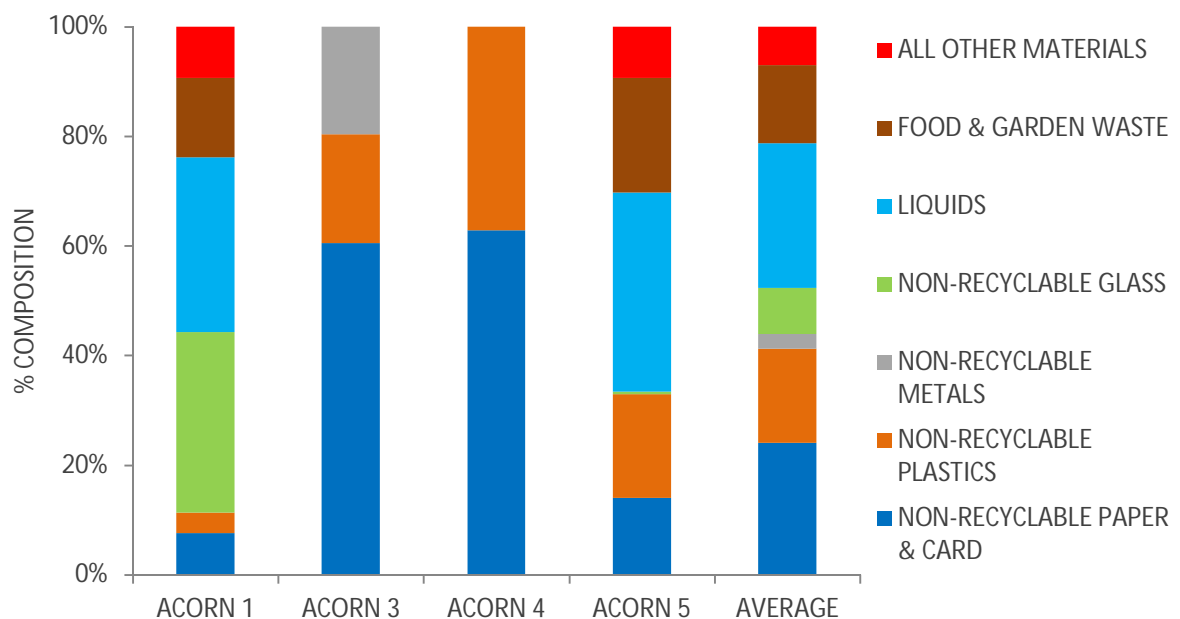

Figure 22: Breakdown of contaminants present within mixed recycling bins (% of contamination).

- Overall, it was seen that the most prevalent single contaminant in the recycling bins was liquids contained mainly in plastic bottles. This formed around 26% of the contamination (0.06kg/hh/wk or 1.5% of recycling).

- Non-recyclable paper and card formed 24% of the contamination; accounting for 0.05kg/hh/wk or 1.4% of recycling.

- Non-recyclable plastics accounted for 17% of contamination

- Food and garden waste 14% of the contamination.

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Food and Garden recycling waste

Set out rates and waste generation

Table 21 and Figure 23 highlight the set out rates for kerbside food recycling observed at the time waste was collected for compositional analysis. Table 22 and Figure 24 show the amount of this recycling waste generated in kg/hh/wk. The same houses were sampled as those included in the residual and recycling bin survey. The overall amount of waste in kilograms per household per week is derived from the number of households who could set out waste and not just those that are participating. These aggregated figures for the recycling waste are shown in tables and figures with additional information relating to individual household samples given where relevant.

Acorns 5 had average set out rates of 19.5% compared with 85% for Acorn 1; an average of 43%

Table 21: Average set out for food and garden recycling waste (%)

% SET OUT RATE	FOOD & GARDEN RECYCLING
ACORN 1	85.0%
ACORN 3	48.5%
ACORN 4	35.0%
ACORN 5	19.5%
WEIGHTED AVERAGE	43.4%

At an average of 6.1kg/hh/wk, Acorn 1 households generated by far the most food and garden recycling. This compares with 1.9kg/hh/wk in Acorn 5. On average Watford households generated 3.1g/hh/wk of food and garden recycling. Solely considering set out bins and average of 7.1g/hh/wk is presented. Even though Acorn 5 households generated the lowest levels of food and garden recycling; they set out the heaviest bins. This suggests the few households that are using this service build up waste and present infrequently.

Table 22: Average kerbside recycling generation rates (kg/hh/wk)

KG/HH/WK	OVERALL KG/HH/WK	KG/HH/WK PER PRESENTED BIN
ACORN 1	6.08	7.15
ACORN 3	2.73	5.63
ACORN 4	2.62	7.48
ACORN 5	1.89	9.69
WEIGHTED AVERAGE	3.10	7.14

Figure 23: Average set out for food and garden recycling waste (%)
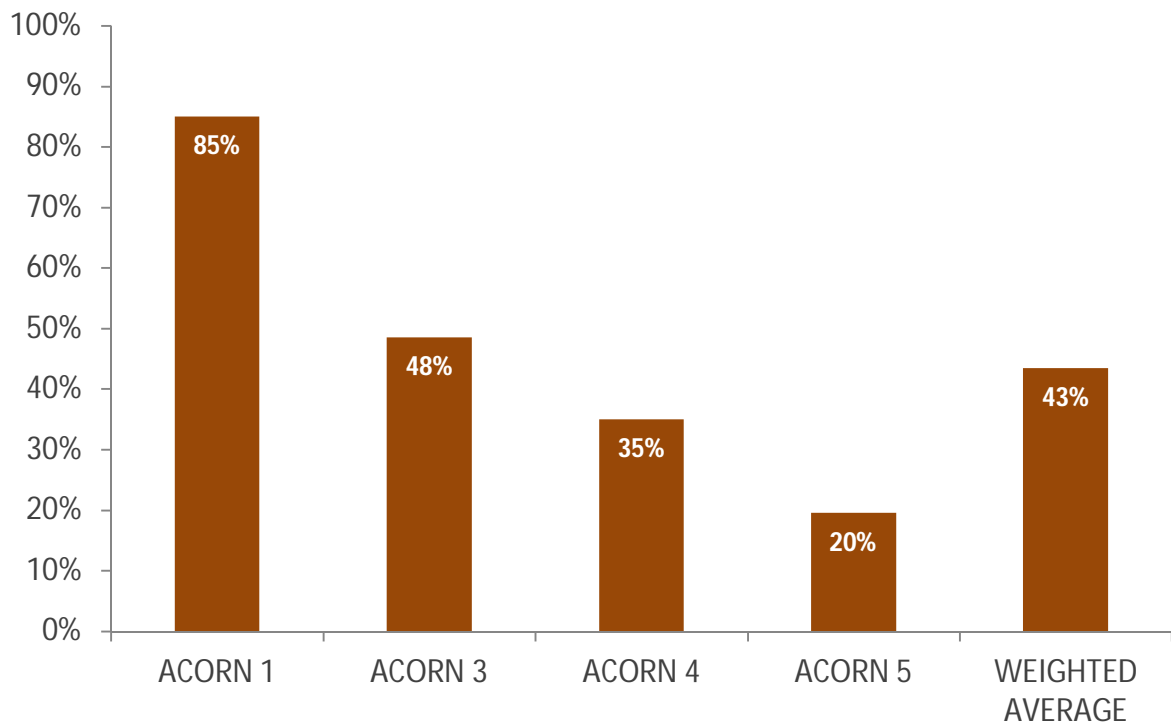
Figure 24: Average food and garden recycling waste generation rates (kg/hh/wk)

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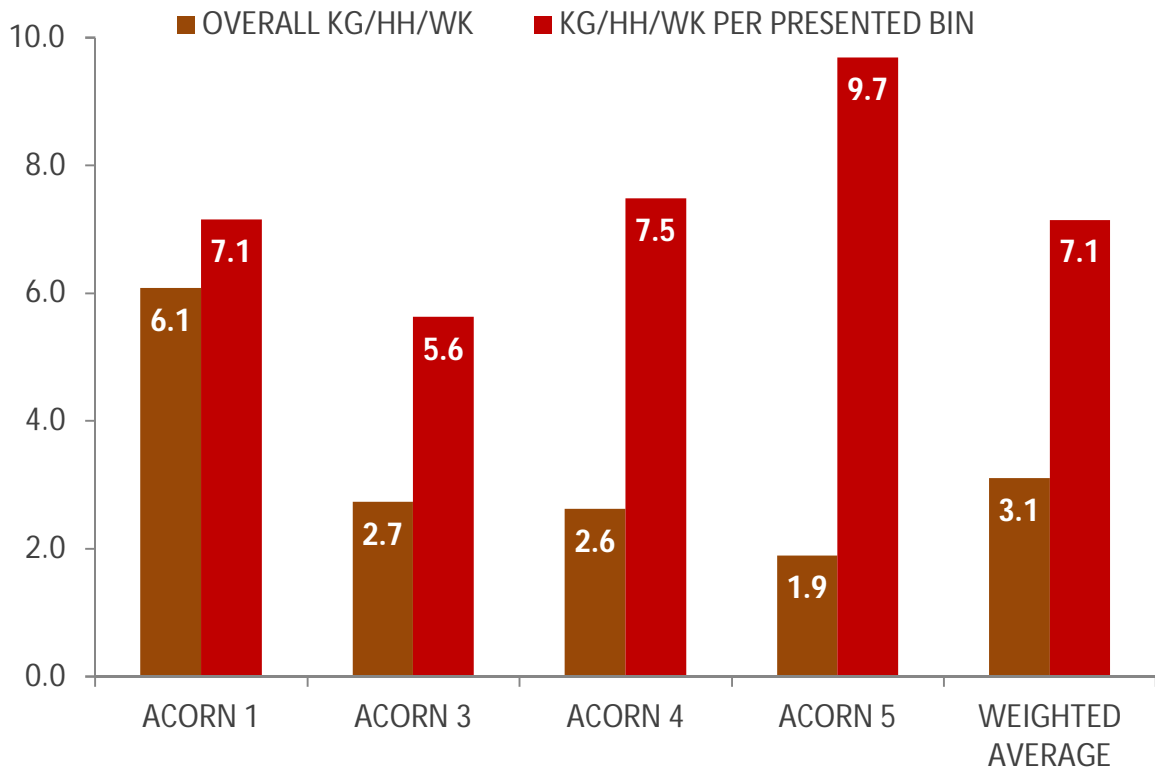
Compositional analysis of food and garden recycling

This section looks at average amounts and composition of the food and garden recycling waste presented by households sampled throughout Watford. Hand sorting of the recycling waste gives concentration by weight figures for the fifteen main categories of waste as well as the more detailed sub-categories. Results can again be expressed in terms of percentage concentration and kg/hh/wk for individual samples and in relation to the household Acorn type surveyed. Table 23 and Figure 25 show food recycling data in terms of percentage composition with Table 24 and Figure 26 showing generation rates for major materials in kg/hh/wk across all surveyed households.

As residual waste will contain a proportion that is classified as potentially recyclable; then food and garden recycling waste will contain a faction that is deemed to be contamination. That is to say that it is not compatible with the materials currently acceptable to the recycling containers it is placed into.

Table 23: Composition of food and garden recycling (% concentration) by Acorn

FOOD AND GARDEN RECYCLING (%)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
GARDEN CLIPPINGS & PRUNINGS	91.57%	95.74%	20.45%	96.96%	68.90%
SOIL & TURF	0.00%	0.00%	20.52%	0.00%	6.96%
ALL UNAVOIDABLE FOOD WASTE	8.19%	1.21%	28.73%	0.72%	12.92%
AVOIDABLE FOOD WASTE - LOOSE	0.24%	2.92%	19.55%	2.33%	7.55%
AVOIDABLE FOOD WASTE – PART USED IN OPEN PACKAGING	0.00%	0.13%	4.24%	0.00%	1.46%
AVOIDABLE FOOD WASTE – FULLY UNOPENED & PACKAGED	0.00%	0.00%	0.00%	0.00%	0.00%
INSEPARABLE INC STRAW / SAWDUST PET BEDDING	0.00%	0.00%	4.96%	0.00%	1.68%
ALL OTHER WASTE	0.00%	0.00%	1.55%	0.00%	0.53%
TOTAL CONTAMINATION	0.00%	0.00%	22.07%	0.00%	7.49%

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Table 24: Composition of food and garden recycling (kg/hh/wk) by Acorn

FOOD AND GARDEN RECYCLING (KG/HH/WK)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	WEIGHTED AVERAGE
GARDEN CLIPPINGS & PRUNINGS	5.56	2.61	0.54	1.83	2.14
SOIL & TURF	0.00	0.00	0.54	0.00	0.22
ALL UNAVOIDABLE FOOD WASTE	0.50	0.03	0.75	0.01	0.40
AVOIDABLE FOOD WASTE - LOOSE	0.01	0.08	0.51	0.04	0.23
AVOIDABLE FOOD WASTE – PART USED IN OPEN PACKAGING	0.00	0.00	0.11	0.00	0.05
AVOIDABLE FOOD WASTE – FULLY UNOPENED & PACKAGED	0.00	0.00	0.00	0.00	0.00
INSEPARABLE INC STRAW / SAWDUST PET BEDDING	0.00	0.00	0.13	0.00	0.05
ALL OTHER WASTE	0.00	0.00	0.04	0.00	0.02
TOTAL CONTAMINATION	0.00	0.00	0.58	0.00	0.23

Figure 25: Composition of food and garden recycling (%) by Acorn

Legend:
- ALL OTHER WASTE
- SOIL & TURF
- INSEPARABLE INC STRAW / SAWDUST PET BEDDING
- AVOIDABLE FOOD WASTE – FULLY UNOPENED & PACKAGED
- AVOIDABLE FOOD WASTE – PART USED IN OPEN PACKAGING
- AVOIDABLE FOOD WASTE - LOOSE
- ALL UNAVOIDABLE FOOD WASTE
- GARDEN CLIPPINGS & PRUNINGS
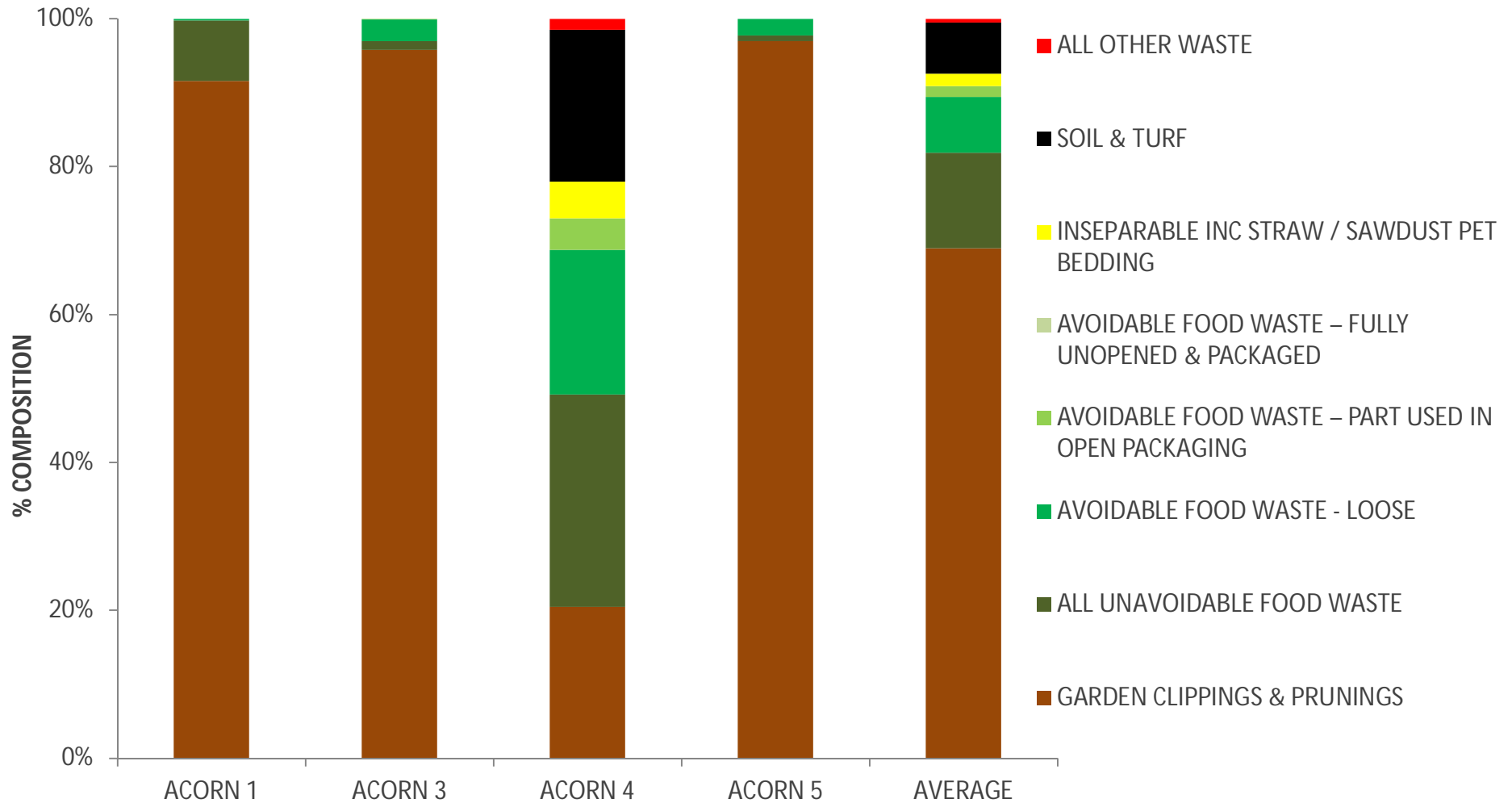
Figure 26: Composition of food and garden recycling (kg/hh/wk) by Acorn

Legend:
- ALL OTHER WASTE
- SOIL & TURF
- INSEPARABLE INC STRAW / SAWDUST PET BEDDING
- AVOIDABLE FOOD WASTE – FULLY UNOPENED & PACKAGED
- AVOIDABLE FOOD WASTE – PART USED IN OPEN PACKAGING
- AVOIDABLE FOOD WASTE - LOOSE
- ALL UNAVOIDABLE FOOD WASTE
- GARDEN CLIPPINGS & PRUNINGS

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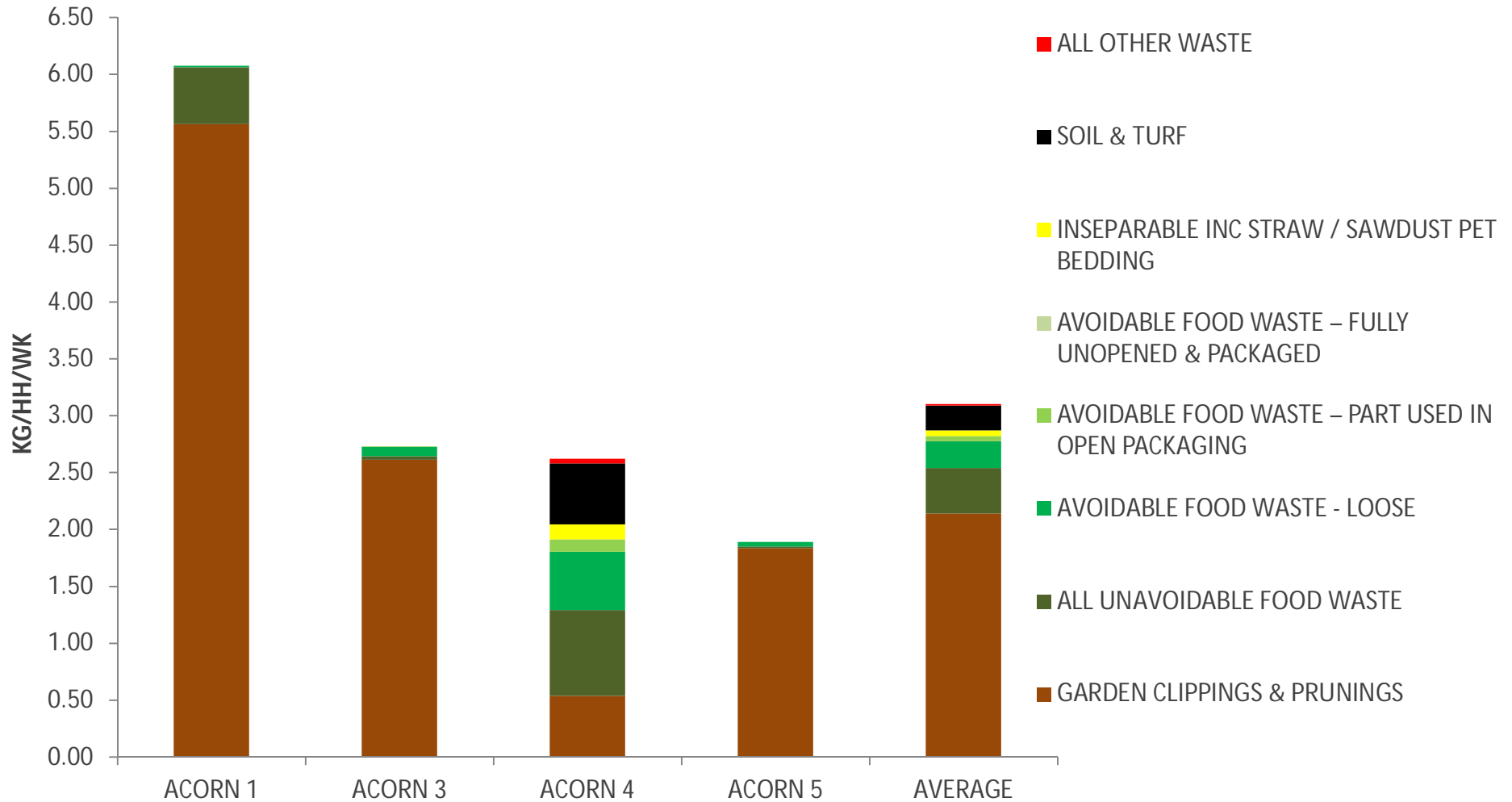
Materials placed in food and garden recycling bins

This chapter looks in more detail at the individual materials placed out for food and garden recycling collections and highlights the effectiveness with which the scheme is capturing these items. Looking at the relationship between the residual and recycling waste streams presented will additionally give indications as to the overall diversion being achieved in the Watford samples.

Table 25 summarises the capture and diversion rates seen for the organic materials collected in the food and garden bins. These figures are calculated by determining the distribution of recyclables across all waste streams for all of the households selected for survey within each sample.

Across Watford around 32.1% of all acceptable food is being correctly recycled at the kerbside. Acorn 5 households recycled just 1.6% of their recyclable food. In comparison Acorn 4 households recycled around 64%. Unavoidable food waste was recycled more efficiently (35%) than avoidable food waste (29%).

All sample areas captured the vast majority of their recyclable garden waste at between 96.3% and 99.8% - an average of 98.7%. Around three quarters of biodegradable pet bedding was recycled – all by Acorn 4 households.

Overall it is estimated that 66% of all acceptable organics are recycled by Watford households.

Table 25: Summary table for material capture and diversion rates (%) for food recycling

FOOD CAPTURE RATES (%)	ACORN 1	ACORN 3	ACORN 4	ACORN 5	AV.
AVOIDABLE FOOD WASTE	63.8%	12.9%	75.6%	0.5%	34.6%
UNAVOIDABLE FOOD WASTE	2.4%	9.9%	54.3%	4.3%	29.0%
ALL FOOD WASTE	36.64%	10.60%	64.17%	1.56%	32.06%
GARDEN VEGETATION	99.75%	99.17%	96.25%	96.68%	98.67%
PET BEDDING	0.00%	N/A	100.00%	N/A	75.42%
CAPTURE ALL ORGANICS	85.92%	73.13%	72.13%	33.83%	65.86%

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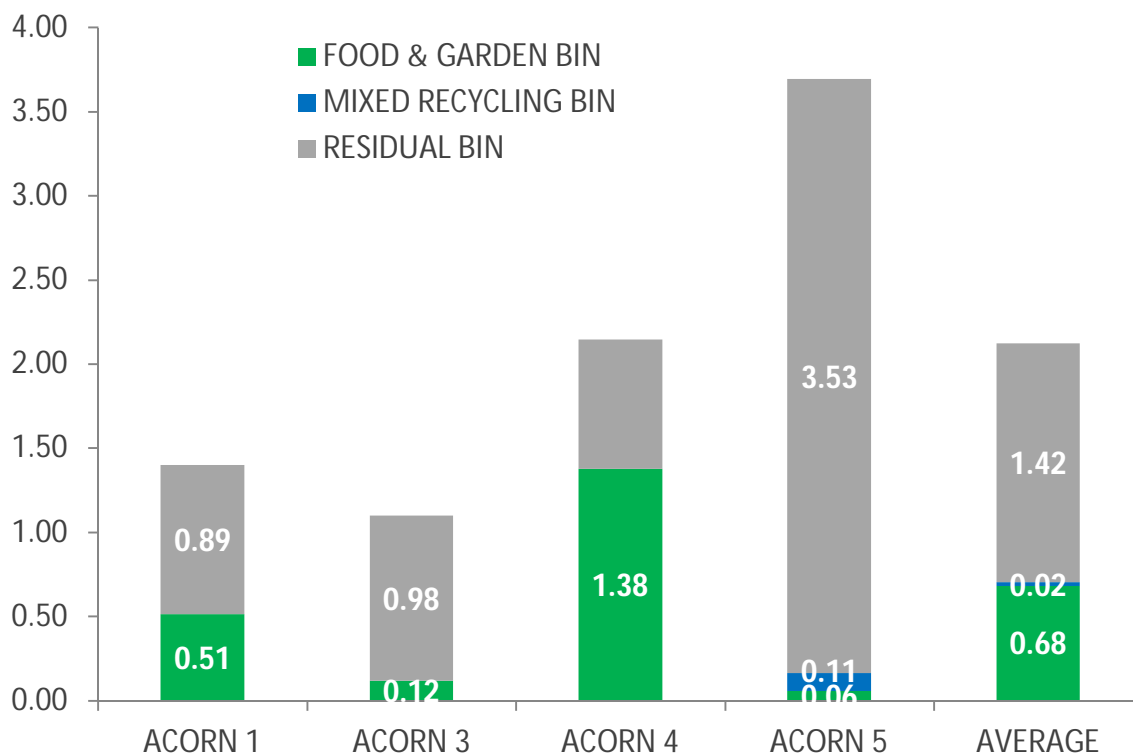waste insights

Food Waste Capture

Acorn 4 residents captured the highest proportion of their recyclable food waste with 64% correctly being recycled. Acorn 3 disposed of the smallest amount of waste food overall at 1.10kg/hh/wk. Acorn 5 generated the most food waste at 3.69kg/hh/wk but were seen to recycle the lowest proportion at 1.6%.

Across Watford it is estimated that 2.12kg/hh/wk of recyclable food waste compatible with recycling collections is generated with around 32% being correctly recycled.

Capture rates for unavoidable food waste such as skin, peel, shells and bone were seen to be higher than those seen for avoidable (i.e. uneaten) food waste. Results showed that between 0.5% (Acorn 5) and 76% (Acorn 4) of unavoidable food waste, and between 2.4% (Acorn 1) and 54.3% (Acorn 4) of avoidable food waste was recycled.

Overall 8% of all food based waste in the recycling bins was packaged. Figure 27 shows the distribution of recyclable food waste throughout the residual and recycling waste by Acorn category. On average, 1.44kg/hh/wk of food waste remains unrecycled.

Figure 27: Distribution of recyclable food within residual and recycling samples (kg/hh/wk)
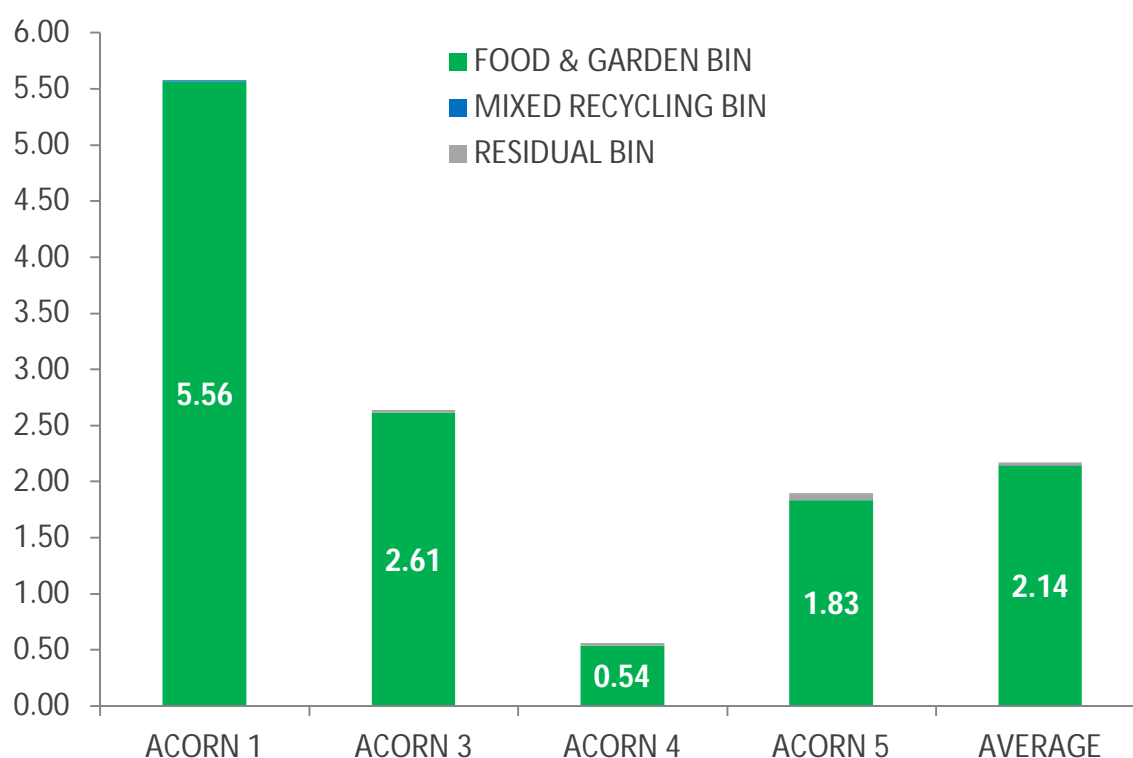
Garden Waste Capture

Acorn 1 residents captured the highest proportion of their recyclable food waste with 99.8% correctly being recycled. These households created the most garden waste at 5.6kg/hh/wk. Acorn 4 disposed of the smallest amount of waste food overall at 0.56kg/hh/wk.

Across Watford it is estimated that 2.17kg/hh/wk of recyclable garden waste compatible with recycling collections is generated with around 98.7% being correctly recycled.

Figure 28: Distribution of recyclable garden waste within residual and recycling samples (kg/hh/wk)

Food Recycling Contamination

From Tables 23 and 24 we can see that overall contamination within the food and garden waste containers was fairly low averaging just 7.5% or 0.23kg/hh/wk. This was exclusively due to contamination from the Acorn 4 sample which was 20.5% soil and turf and also had trace levels of paper and wood waste.

Total waste generation levels & diversion

Capture rates determine how much of a material that should be recycled actually is being recycled. Diversion rates show the percentage of total generated waste produced from an area that is being 'Diverted' via the available recycling stream(s). Table 26 and Figure 29 show the total waste generation (residual, dry recycling and organic recycling) for each of the areas sampled. Table 27 and Figure 30 show the overall proportion of material that is being correctly diverted. Acorn 4 produced the lowest levels of total waste at 9.37kg/hh/wk with the households from Acorn 1 and 5 generating the most at 14.0kg/hh/wk. Across Watford it is estimated that the weekly output of kerbside is 11.5kg/hh/wk.

Table 26: Average waste generation levels by Acorn (kg/hh/wk) and overall diversion

TOTAL WASTE KG/HH/WK	ACORN 1	ACORN 3	ACORN 4	ACORN 5	AV.
RESIDUAL	4.00	3.97	3.00	9.02	4.66
RECYCLING	3.88	4.09	3.75	3.05	3.69
FOOD & GARDEN	6.08	2.73	2.62	1.89	3.10
TOTAL	13.95	10.79	9.37	13.96	11.45

Table 27: Overall % diversion by Acorn

% DIVERSION RATES	ACORN 1	ACORN 3	ACORN 4	ACORN 5	AV.
RECYCLING	25.64%	36.62%	39.42%	18.18%	30.39%
FOOD & GARDEN	43.55%	25.28%	21.78%	13.54%	25.05%
TOTAL	69.19%	61.90%	61.20%	31.72%	55.44%

When combining the diversion achieved from all recycling streams it is estimated that households within Watford are diverting around 55.4% of their kerbside waste. This represents around 6.4kg/hh/wk of the 11.5kg/hh/wk being generated. Acorn 1 households divert over two thirds (69.2%) of kerbside waste compared with 31.7% for Acorn 5. Around 30.4% of diversion is via blue lidded bins with 25.1% via food and garden collections. Were all of the recyclable materials disposed of in the desired recycling container the maximum achievable diversion would be 73.6%. Data from this survey suggests a level of 243kg/hh/yr for residual waste and 598kg/hh/yr for total kerbside waste.

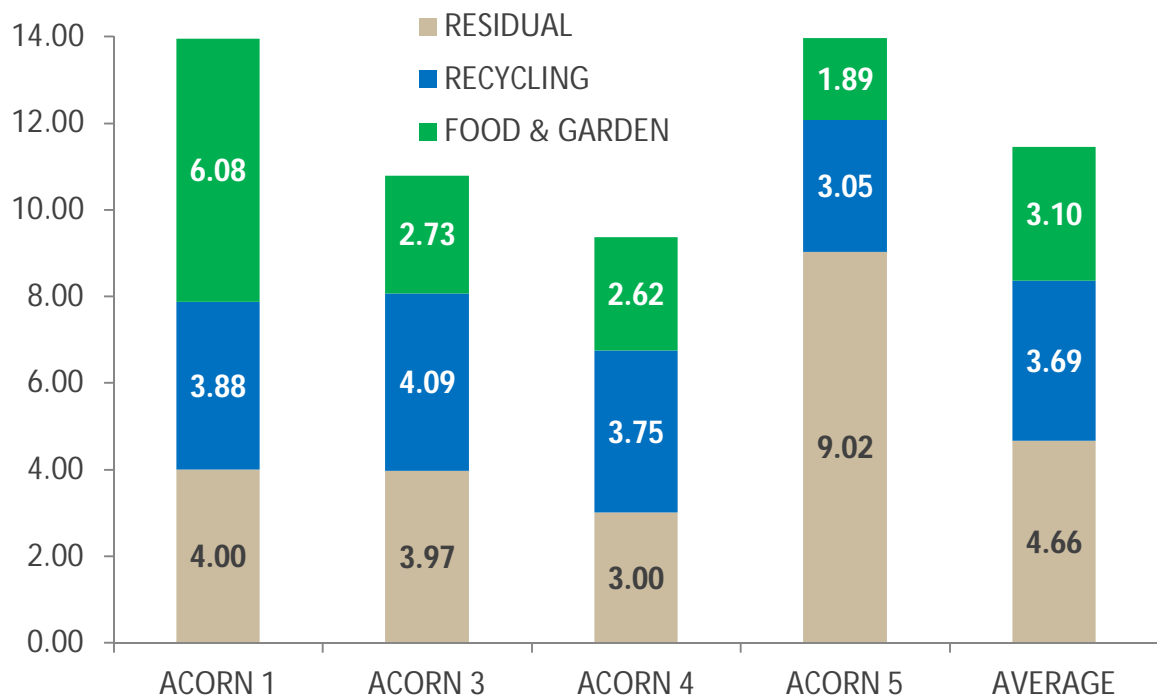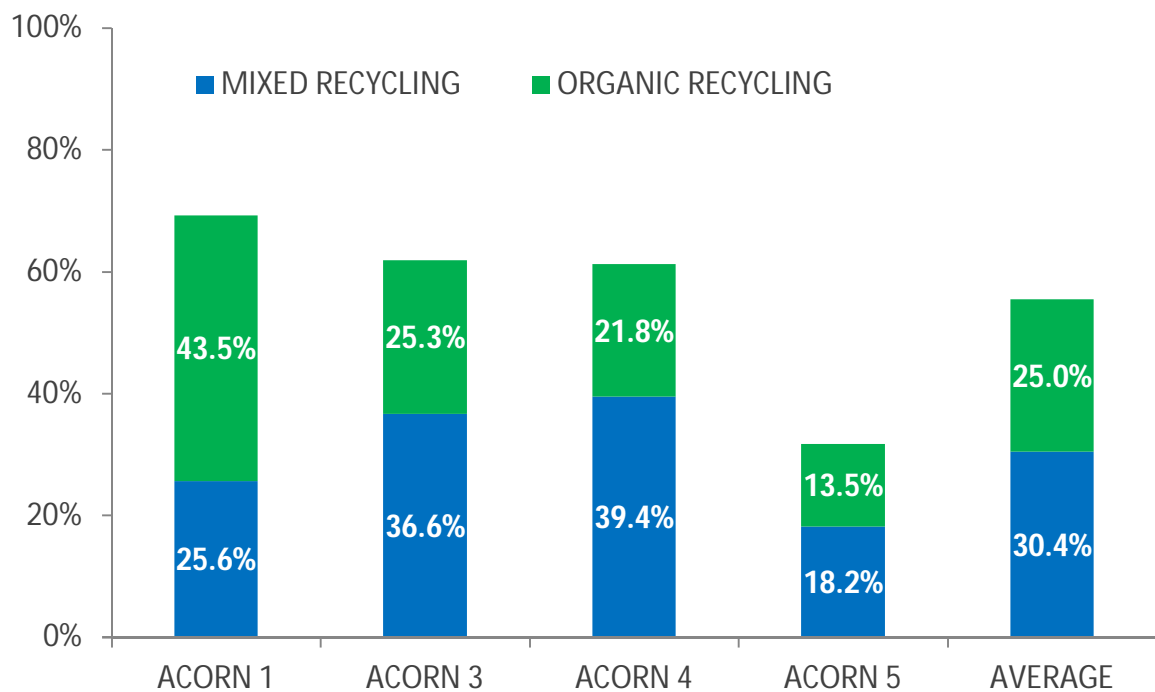**Figure 29: Total waste generation levels by Acorn (kg/hh/wk)**

Figure 30: Overall % diversion by Acorn

Appendix 1: ACORN Category Classification

1	**Affluent Achievers**
1.A	**Lavish Lifestyles**
1.A.1	Exclusive enclaves
1.A.2	Metropolitan money
1.A.3	Large house luxury
1.B	**Executive Wealth**
1.B.4	Asset rich families
1.B.5	Wealthy countryside commuters
1.B.6	Financially comfortable families
1.B.7	Affluent professionals
1.B.8	Prosperous suburban families
1.B.9	Well-off edge of towners
1.C	**Mature Money**
1.C.10	Better-off villagers
1.C.11	Settled suburbia, older people
1.C.12	Retired and empty nesters
1.C.13	Upmarket downsizers
2	**Rising Prosperity**
2.D	**City Sophisticates**
2.D.14	Townhouse cosmopolitans
2.D.15	Younger professionals in smaller flats
2.D.16	Metropolitan professionals
2.D.17	Socialising young renters
2.E	**Career Climbers**
2.E.18	Career driven young families
2.E.19	First time buyers in small, modern homes
2.E.20	Mixed metropolitan areas
3	**Comfortable Communities**
3.F	**Countryside Communities**
3.F.21	Farms and cottages
3.F.22	Larger families in rural areas
3.F.23	Owner occupiers in small towns and villages
3.G	**Successful Suburbs**
3.G.24	Comfortably-off families in modern housing
3.G.25	Larger family homes, multi-ethnic areas
3.G.26	Semi-professional families, owner occupied neighbourhoods
3.H	**Steady Neighbourhoods**
3.H.27	Suburban semis, conventional attitudes
3.H.28	Owner occupied terraces, average income
3.H.29	Established suburbs, older families
3.I	**Comfortable Seniors**
3.I.30	Older people, neat and tidy neighbourhoods
3.I.31	Elderly singles in purpose-built accommodation
3.J	**Starting Out**
3.J.32	Educated families in terraces, young children
3.J.33	Smaller houses and starter homes
4	**Financially Stretched**
4.K	**Student Life**
4.K.34	Student flats and halls of residence
4.K.35	Term-time terraces
4.K.36	Educated young people in flats and tenements
4.L	**Modest Means**
4.L.37	Low cost flats in suburban areas
4.L.38	Semi-skilled workers in traditional neighbourhoods
4.L.39	Fading owner occupied terraces
4.L.40	High occupancy terraces, many Asian families
4.M	**Striving Families**
4.M.41	Labouring semi-rural estates
4.M.42	Struggling young families in post-war terraces
4.M.43	Families in right-to-buy estates
4.M.44	Post-war estates, limited means
4.N	**Poorer Pensioners**
4.N.45	Pensioners in social housing, semis and terraces
4.N.46	Elderly people in social rented flats
4.N.47	Low income older people in smaller semis
4.N.48	Pensioners and singles in social rented flats
5	**Urban Adversity**
5.O	**Young Hardship**
5.O.49	Young families in low cost private flats
5.O.50	Struggling younger people in mixed tenure
5.O.51	Young people in small, low cost terraces
5.P	**Struggling Estates**
5.P.52	Poorer families, many children, terraced housing
5.P.53	Low income terraces
5.P.54	Multi-ethnic, purpose-built estates
5.P.55	Deprived and ethnically diverse in flats
5.P.56	Low income large families in social rented semis
5.Q	**Difficult Circumstances**
5.Q.57	Social rented flats, families and single parents
5.Q.58	Singles and young families, some receiving benefits
5.Q.59	Deprived areas and high-rise flats

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