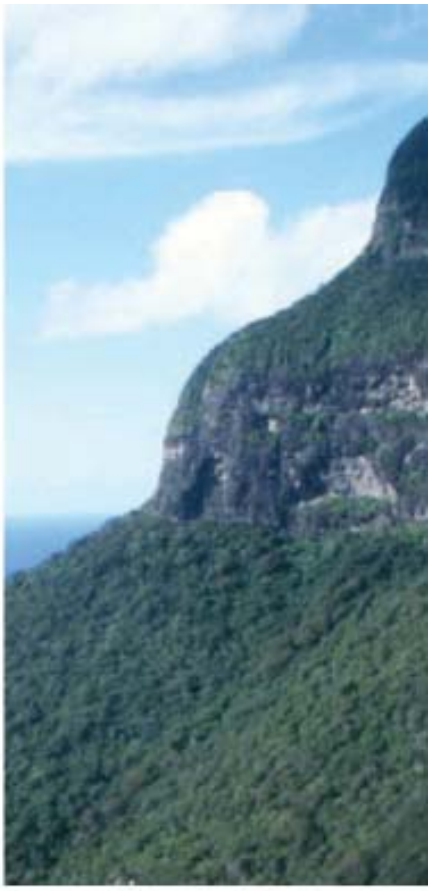

FINAL

ORGANICS BIN TRIAL WASTE AUDIT REPORT

FOR

EMRC

JULY 2009

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DISCLAIMER

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EXECUTIVE SUMMARY

The Waste Authority provided the Eastern Metropolitan Regional Councils (EMRC) with a $95,000 grant to help conduct a kerbside organics waste collection trial. The trial, was to assess the potential for an organics bin in the region in conjunction with an alternative waste treatment facility.

The EMRC coordinated the trial of a new household organics bin (food waste and green waste) within its six local government areas (LGA) and engaged APC Environmental Management (APC) to provide advice in relation to trial parameters and street selection for the trial.

APC advised in a report titled *Organics Trial Scoping Study* that:

- The whole sample must be large enough to detect the magnitude of change in composition (by weight) of the existing garbage bin and the new organics bin.
- The sample should have equal numbers in each LGA so the results can be indicative for each LGA.
- To avoid unnecessary complexity, the selected households should be single dwellings only (i.e. no blocks of flats/apartments that have communal waste disposal arrangements).
- The trial should run for long enough to give residents the opportunity to adapt their waste disposal habits to the new arrangement.
- Households should be audited at least twice – once prior to the new container being supplied, once after.
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- The absolute minimum time to conduct the trial should be three months if fortnightly collections (i.e. six collections) are undertaken and six weeks if weekly collections are undertaken as behaviour tends to modify over time.

Given budget constraints, it was deemed that 50 randomly selected but representative households in each local council would be supplied with a new 240-litre organics bin. This bin is in addition to the existing garbage and recycling bins currently in use. The selected households also received a 6.6-litre bio-basket and compostable bag liners to encourage the separation of food waste at the source in the kitchen.

The objective of the trial was to determine how much green waste and food waste can be diverted from the garbage stream to the newly supplied organics bin. To determine the performance of the trial, the EMRC engaged APC to conduct a pre waste audit of the garbage bins and a post waste audit of the garbage and organics bins at the selected households in each of the six local governments.

This report provides the results of the trial on a council by council and regional basis.

In total, APC sorted 9.2 tonnes of household waste into 17 agreed categories to inform future decision-making in respect to the future of an organics service to the EMRC member councils and their constituents.

The key findings of the organics trial waste audits are summarised as follows:

Pre Trial

APC staff visited 323 addresses to collect 287 samples, which represents a presentation rate of 89% that comprised the regional sample of the pre trial audit. The pre trial audit was conducted from 21st – 28th April 2009. In total, 4,714kgs of general waste from the garbage stream and a further 340kgs of garden waste from Bayswater Council was sorted into 16 agreed categories. There was a diverse range of bin weights, composition and fullness between the samples within each of the six member and participating councils.

Garbage generation **–** The average weight of garbage bins prior to the commencement of the organics trial ranged from the lowest of 11.4kg at Mundaring to the highest 20.2kgs at Belmont. The average across the region was 16.3kg per household per week.

Garbage composition **–** The organic fraction represents 54% of the garbage stream with food waste(28.6%) and garden waste (25.4%). Food was most prevalent in the garbage bins at Swan Council where 7.95kg were present compared to Bayswater and Kalamunda Councils with just 3.43kg. Garden waste was lowest in Mundaring Council at just 0.63kg and highest at Kalamunda with 7.21kgs.

Total waste generation – Bayswater already had a garden waste bin prior to the trial commencing and when the average weight of this bin at 5.9kg per week was added to the garbage bin at 11.6kg, it was found Bayswater is generating a total of 17.5kg per household per week.

Garbage bin volume – The average space used in the existing garbage bin ranged from 5 – 105% with the average being 75% bin fullness, providing an average of 25% spare capacity in the typical 240-litre mobile garbage bin.

Post Trial

APC staff collected samples from 171 households' garbage bins and 198 organics bins, which comprised the regional sample. These samples were out of a possible 303 bins delivered for the trial however only 247 households actually participated. A number of operational issues occurred during the week of the post audit collection and, in some cases, corresponding garbage bins were collected up to two hours earlier than we were advised would be the normal collection time. This unfortunately happened on more than one occasion due to poor communication between Cleanaway operational staff and collection drivers.

The trial was conducted for eight weeks with the post trial audit conducted from 16th – 23rd June 2009. In total, 2,093kgs of waste from the garbage stream was sorted and a further 2,145kg of garden waste was audited from the trial organic bins. In total, 4,238kgs of household waste and organics was sorted into the agreed categories. As

with the pre trial, there was a diverse range of bin weights, composition and fullness between the samples within each of the six member and participating councils.

Garbage generation – The average weight of garbage bin dropped from 16.3kgs to 12.9kg, a decrease of 3.4kg following the introduction of the organics bin. Belmont council decreased from 20.2kg to 16.3kg and Mundaring Council decreased from 11.4 to 9.2kg per household per week.

Garbage composition – The proportion of organics in the garbage stream decreased from 54% to 32.1%, a decrease of 21.7 percentage points. Food waste decreased by 7.8% – from 28.6% to 20.8%. Garden waste decreased by 14.1% – from 25.4% to 11.3%. In addition a further 5.6% of the garbage stream was wood and straw, which could have been directed to the organics stream, increasing the available organics stream to 37.7%.

Food was most prevalent in the garbage bins at Swan Council at 3.4kgs, a decrease from the previous 7.95kg. The lowest amount recorded was at Mundaring at 1.9kgs a decrease from 4.68kgs previously.

Garden waste was lowest in Bayswater at 0.07kgs and the highest at Belmont with 4.62kgs where previously this was 4.99kgs.

Garbage bin volume – The average space used in the existing garbage bin ranged from 5 – 115% with the average being 58% bin fullness, providing an average of 42% spare capacity in the typical 240-litre mobile garbage bin.

Organics generation – The average weight of organics bin was 10.65kg and ranged between 1 – 100% full with the average bin fullness of 19%.

Organics composition – Collectively food and green waste accounted for 94.8% of all material in the organics stream with food representing 29.4% and garden waste 65.4%. A further 2.7% comprised wood and straw and a further 1.6% comprised paper, cardboard and earth, all of which are fully compostable. The total organic fraction in the bin was 99.1%, an outstanding achievement. Mundaring recorded the highest amount of green waste (9.72kg) and Belmont had the highest amount of food waste (4.6kg) per household.

Contamination – The contamination rate was 0.9% and comprised plastics, metal, glass and nappies.

Total waste generation – Bayswater was the only council that had a garden waste bin prior to the trial commencing. The table below shows the average weight per household bin by type pre and post the trial. It can be seen that, on average, the total waste generated by these sample households increased from 16.3kg to 23.55kg per week.

Council	Pre Trial		Post Trial		Total Waste Stream
	Garbage	Greenwaste	Garbage	Organics bin	
	Weight Kgs Per Household Per Week				
Bassendean	15.8	N/A	11.4	6.6	18
Bayswater	11.6	5.9	15.3	11.2	26.5
Belmont	20.2	N/A	16.5	13.0	29.5
Kalamunda	18.6	N/A	13.0	11.6	24.6
Mundaring	11.4	N/A	9.2	14.2	23.4
Swan	20.1	N/A	12.1	7.3	19.4
Average Household	**16.3**	**5.9**	**12.9**	**10.65**	**23.55**

In summary, the householders who participated embraced the trial, achieving a decrease in average garbage stream weight of 3.4kg with specific decreases in garden waste by 14.1% and food waste by 7.8%. However, total waste generated increased from 16.3kg to 23.55kg. This increase in total waste generation came directly from the organics stream which represented 10.65kg per household. Even in Bayswater where an existing green waste collection service already generated 5.9kg per household, the trial increased the amount of green waste collected to 11.2kg per household. Contamination was extremely low at 0.9%.

1. BACKGROUND

The Waste Authority provided the Eastern Metropolitan Regional Councils (EMRC) with a $95,000 grant to help conduct an organic waste trial. The trial was to assess the potential for an organics bin in the region in conjunction with an alternative waste treatment facility..

The organic waste collection trial required the introduction of a three-bin waste collection system to selected houses within each local government area represented by the EMRC.

EMRC sought advice from APC in relation to trial parameters and street selection for the trial. APC advised in a report titled *Organics Trial Scoping Study* that:

- The whole sample must be large enough to detect the magnitude of change in composition (by weight) of the existing garbage bin and the new organics bin.
- The sample should have equal numbers in each LGA so the results can be indicative for each LGA.
- To avoid unnecessary complexity, the selected households should be single dwellings only (i.e. no blocks of flats/apartments that have communal waste disposal arrangements).
- The trial should run for long enough to give residents the opportunity to adapt their waste disposal habits to the new arrangement.
- Households should be audited at least twice – once prior to the new container being supplied, once after.
- Garbage and organics waste containers should be audited separately to determine the waste composition of each stream to determine the change in composition of waste in each stream.
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- The absolute minimum time to conduct the trial should be three months if fortnightly collections (i.e. six collections) are undertaken and six weeks if weekly collections are undertaken as behaviour tends to modify over time.

Given budget constraints, it was deemed that 50 randomly selected but representative households in each local council would be invited to participate in the trial. APC used the following method to select streets deemed suitable for inclusion in the trial:

- ABS 2006 Population Census data was reviewed for each of the six LGAs,
- Social indicators for each LGA were considered including:
    - Average household size,
    - Median household income ($/weekly),
    - Median housing loan repayment ($/monthly).
- These social indicators were used in combination to assess which postcode within each LGA was broadly similar to the whole LGA.
- Sample streets were selected within postcode areas that were most similar in social character to the whole LGA.

- Random streets within these areas were selected and checked with Google Maps to ensure that the area was residential and had more than fifty (50) households to draw a sample.
- In some cases where the streets are small or sparsely populated, several neighbouring streets were also nominated so that a sample of fifty (50) was achieved.
- Five street locations were provided for each LGA, to give alternative choices in case any of the recommended street locations were unsuitable for any reason.

2. INTRODUCTION

The objective of the trial was to determine how much green waste and food waste is diverted from the garbage stream to the newly supplied organics container.

To determine the performance of the trial, the EMRC engaged APC to conduct a pre waste audit of the garbage bins of selected households in the selected streets to gather baseline data on waste generation and composition prior to the trial commencing. At the conclusion of the trial, a post waste audit of the garbage and organics bins at the selected households in each of the six local governments was also conducted to enable direct comparisons to be made.

The EMRC coordinated the trial on behalf of the member Councils. Following the base line audit, each household within the randomly selected streets deemed to closely represent the socio demographic profile of the entire council area was advised by letter from the EMRC that they had been selected to take part in the organics trial. The letter provided an opportunity to withdraw if they did not wish to participate. The EMRC then arranged for the supply of a new 240-litre organics bin. This bin, in addition to the existing garbage and recycling bins currently in use would be collected weekly. The selected households also received a 6.6-litre bio-basket and compostable bag liners to encourage the separation of food waste at the source in the kitchen.

3. AUDIT METHODOLOGY

3.1 Sample Size

Due to budget constraints with the grant, the EMRC determined that a total sample of 300 households or 50 households per local government area would be the trial size.

Bayswater residents are the only council to have already introduced an organics bin and therefore this bin was included in the waste audit for the pre–audit to enable the entire garbage and garden waste stream to be sampled. In total, 950 mobile garbage bins were to be audited as part of this project. Table 1 below shows the details of the sample size per council for the pre trial waste audit and Table 2 sets out the sample sizes for the second audit, which was conducted at the completion of the organics trial.

Table 1 - Sample Size Per Council – Pre Trial Commencement

Local Government	Garbage Bins To Be Audited	Organics Bins To Be Audited	Total sample
Bassendean	50	N/A	50
Bayswater	50	50	100
Belmont	50	N/A	50
Kalamunda	50	N/A	50
Mundaring	50	N/A	50
Swan	50	N/A	50
Totals	**300**	**50**	**350**

Table 2 - Sample Size Per Council – Audit 2 Post Trial

Local Government	Garbage Bins To Be Audited	Organics Bins To Be Audited	Total sample
Bassendean	50	50	100
Bayswater	50	50	100
Belmont	50	50	100
Kalamunda	50	50	100
Mundaring	50	50	100
Swan	50	50	100
Totals	**300**	**300**	**600**

3.2 Sample Collection

APC recommended that sampling should be done within a whole street or neighbouring streets. EMRC specified that collection should occur on the "normal day of collection for the area". The EMRC provided a list of the collection days for each of the streets selected by APC. The full list of recommended streets by local government area is provided in the tables below:

Table 3 - Recommended Streets for Sampling in Bassendean LGA

Street(s)	Suburb	Collection Day
Carman Way/Cumberland Way	Bassendean	Wednesday
Colstoun Rd/Margaret St	Ashfield	Tuesday
Esther St	Eden Hill	Thursday
Parker St	Bassendean	Monday
Wilson St	Bassendean	Monday

Table 4 - Recommended Streets for Sampling in Bayswater LGA

Street(s)	Suburb	Collection Day
Hudson St	Bayswater	Tuesday
Gilbert St	Bayswater	Monday
Kennedy St	Maylands	Wednesday
Rosebery St	Bayswater	Wednesday
Rothbury Rd	Embleton	Tuesday

Table 5 - Recommended Streets for Sampling in Belmont LGA

Street(s)	Suburb	Collection Day
Kooyong Rd	Rivervale	Monday
Lintonmarc Dr	Redcliffe	Friday
Toorak Rd	Rivervale	Monday
Williamson Av	Belmont	Thursday

Table 6 - Recommended Streets for Sampling in Kalamunda LGA

Street(s)	Suburb	Collection Day
David St	Maida Vale	Monday
Golden Cres	High Wycombe	Monday
Kiandra Way	High Wycombe	Monday
Meloway Dr	Maida Vale	Wednesday
Walker Cres	High Wycombe	Monday

Table 7 - Recommended Streets for Sampling in Mundaring LGA

Street(s)	Suburb	Collection Day
Laslett Circle	Mundaring	Thursday
Hanley St/Hawdon St/Bentley St	Stoneville	Monday

Table 8 - Recommended Streets for Sampling in Swan LGA

Street(s)	Suburb	Collection Day
Albatross Loop	Beechboro	Friday
Clipper Dr	Ballajura	Monday
Rainbow Cres	Beechboro	Friday
Rhine Cres	Beechboro	Thursday
Rosella Cir	Ballajura	Monday

From the collection days above, APC determined which streets were selected as consecutive collection days were required by the audit team. This single factor dictated which streets were selected from the streets provided above. The final selection of streets (Table 9) was based on a visual assessment by the EMRC and the member Council staff, as some of the nominated streets were unsuitable having multi-unit developments and high rise or insufficient households for the quota of 50.

Table 9 - Final Selected Streets For Organics Trial

Council	Street (s)	Suburb
Bassendean	Margaret St	Ashfield
Bayswater	Rosebery Street	Bayswater
Mundaring	Laslett Circle, Luhrs Court	Mundaring
Swan	Albatross Loop, Shelduck Crescent	Beechboro
Kalamunda	David St, Emerald Crt, Opal Crt, Gem Crt	Maida Vale
Belmont	Armadale Road (between Wright St & Oates St)	Kewdale

On the day of the normal waste collection, EMRC provided a dedicated collection vehicle and driver to collect the waste/organics bins from the selected streets and deliver to the sorting site provided by the EMRC at Hazelmere.

APC's collection and audit supervisor accompanied the collection vehicle to direct the driver to the correct street and to record the property or house number from which the sample was collected and to record the volume of the bin used prior to collection.

Where households didn't present a bin this was also recorded and the next bin was substituted until 50 bins were obtained. A copy of the data recording sheet is provided in ***Appendix 1.***

The supervisor then travelled with the vehicle to the sort location for unloading of the sample at Hazelmere. Each day, the APC supervisor faxed to the organic bin delivery contractor the recording sheet with the list of the addresses from where samples had been collected that morning so that organic bins could be delivered to these same addresses.

3.3 Waste Audit

3.3.1 Sorting Location

Sorting took place at the EMRC depot at Lot 100 Lakes Road, Hazelmere. The EMRC provided mobile garbage bins into which samples were sorted, sorting tables and electric ovens for moisture testing of samples. The EMRC also arranged for the removal of all sorted waste on a daily basis.

3.3.2 Sorting Method

The entire truck load from each LGA was delivered and discharged on to a clean concrete floor and sorted progressively over the course of a day by a team of auditors. The waste was transferred to the sorting tables covered by tarpaulins and separated into the specified categories as specified in the scope of works and provided in ***Appendix 2***.

The garden waste was discharged on to the clean concrete and separated by the use of rakes and shovels. Any material deemed to be contaminant was kept separate and later sorted into categories and weighed and deemed to be contamination if it was not food waste.

For each stream, quantities of each separated component material were weighed on a set of electronic scales. The weight of each material or item was recorded. All materials were sorted into the classifications as specified in the scope. Sorting of each sample was completed on the day of collection. The following photos show the sorting processing.



3.4 Moisture Testing

The EMRC specified that moisture analysis was required of the garbage and organics bin. The EMRC provided two laboratory ovens for moisture analysis of samples. Three one-kilogram samples of food, composite waste and garden waste were taken from the garbage stream from each of the six (6) participating EMRC councils (i.e. 18 samples in total).

The sample was placed in an aluminium baking tray and weighed. The weight was recorded and the tray placed in the oven, which had been heated to 105°C. At the same time the following day, that is, after 24 hours, the sample was removed from the oven, weighed again and the weight recorded. By subtracting the weight of the sample after it was placed in the oven from the weight of the sample before it was placed in the oven, it was possible to calculate the percentage of moisture loss per sample.

APC repeated this process daily at the pre and post trial audit. A copy of the recording sheet is provided in ***Appendix 3*** and photos depicting the moisture testing process are provided below:






BEECHBORO - SWAN
GARBAGE BIN - FOOD


3.4 Workplan

Tables 10 and 11 below outline the work plan for the pre and post audit period.

Table 10 - Work Plan – Pre Audit 21 – 28th April

Day number	Day	Activity
1	Monday	Pre project meeting, audit site establishment
2	Tuesday	Collect garbage and audit council 1
3	Wednesday	Collect garbage and audit council 2
4	Thursday	Collect garbage and audit council 3
5	Friday	Collect garbage and audit council 4
	Saturday, Sunday	
6	Monday	Collect garbage and audit council 5
7	Tuesday	Collect garbage and organics council 6, audit garbage and organics
8	Wednesday	Audit garbage from council 6
9	Thursday	Complete moisture testing, debrief project manager

Table 11 - Work Plan – Post Trial Audit 16 – 23rd June

Day number	Day	Activity
1	Monday	Pre project meeting, audit site establishment
2	Tuesday	Collect garbage and organics, audit council 1
3	Wednesday	Collect garbage and organics, audit council 2
4	Thursday	Collect garbage and organics, audit council 3
5	Friday	Collect garbage and organics, audit council 4
	Saturday, Sunday	
6	Monday	Collect garbage and organics, audit council 5
7	Tuesday	Collect garbage and organics, audit council 6
8	Wednesday	Complete moisture testing, debrief project manager

3.5 Issues Affecting Sample Collection and Sorting

During the post trial audit, samples were only collected from properties where both the garbage and organics bins were presented. If only the garbage bin was presented, then the volume of that bin was recorded but the sample not collected.

Where organics bins were presented without an accompanying garbage bin, then the organics sample was collected as this was the last day of the trial and the bin itself was being collected by another truck immediately after APC had collected the bin contents.

A number of operational issues arose during the post audit execution, mainly in relation to the agreed bins having already been serviced by the incumbent contractor prior to collection by the audit team for sampling. These issues are discussed in the individual council analysis section prior to the results of the post trial audit.

4. KEY FINDINGS

In total, APC sorted 9.2 tonnes of household waste into 17 agreed categories to inform future decision-making in respect to the future of an organics service to the EMRC member councils and their constituents.

The key findings of the organics trial waste audits are summarised as follows:

Pre Trial

APC staff visited 323 addresses to collect 287 samples, representing a presentation rate of 89%, which comprised the regional sample of the pre trial audit. The pre trial audit was conducted from 21st – 28th April 2009. In total, 4,714kgs of general waste from the garbage stream and a further 340kgs of garden waste from Bayswater Council were sorted into 16 agreed categories. There was a diverse range of bin weights, composition and fullness between the samples within each of the six member and participating councils.

Garbage generation – The average weight of garbage bin prior to the commencement of the organics trial ranged from the lowest of 11.4kg at Mundaring to the highest of 20.2kgs at Belmont. The average across the region was 16.3kg per household per week.

Garbage composition – The organic fraction represents 54% of the garbage stream with food waste (28.6%) and garden waste (25.4%). Food was most prevalent in the garbage bins at Swan Council where 7.95kg were present compared to Bayswater and Kalamunda Councils with just 3.43kg. Garden waste was lowest in Mundaring Council at just 0.63kg and highest at Kalamunda with 7.21kgs.

Total waste generation – Bayswater already had a garden waste bin prior to the trial commencing and when the average weight of this bin at 5.9kg per week was added to the garbage bin (11.6kg) it was found Bayswater generates a total of 17.5kg per household per week.

Garbage bin volume – The average space used in the existing garbage bin ranged from 5 – 105% with the average being 75% bin fullness, providing an average of 25% spare capacity in the typical 240-litre mobile garbage bin.

Post Trial

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The trial was conducted for eight weeks with the post trial audit conducted from 16th – 23rd June 2009. In total, 2,093kgs of waste from the garbage stream was sorted and a further 2,145kg of garden waste was audited from the trial organic bins. In total, 4,238kgs of household waste and organics was sorted into the agreed categories. As with the pre trial, there was a diverse range of bin weights, composition and fullness between the samples within each of the six member and participating councils.

Garbage generation – The average weight of garbage bin dropped from 16.3kgs to 12.9kg, a decrease of 3.4kg, following the introduction of the organics bin. Belmont council decreased from 20.2kg to 16.3kg and Mundaring Council decreased from 11.4 to 9.2kg per household per week.

Garbage composition – The proportion of organics in the garbage stream decreased from 54% to 32.1%, a decrease of 21.7 percentage points. Food waste decreased by 7.8%; from 28.6% to 20.8%. Garden waste decreased by 14.1%; from 25.4% to 11.3%. In addition, a further 5.6% of the garbage stream was wood and straw, which could have been directed to the organics stream, increasing the available organics stream to 37.7%.

Food was most prevalent in the garbage bins at Swan Council at 3.4kgs, a decrease from the previous 7.95kg. The lowest amount recorded was at Mundaring at 1.9kgs a decrease from 4.68kgs previously.

Garden waste was lowest in Bayswater at 0.07kgs and the highest at Belmont with 4.62kgs, where previously this was 4.99kgs.

Garbage bin volume – The average space used in the existing garbage bin ranged from 5 – 115%, with the average being 58% bin fullness, providing an average of 42% spare capacity in the typical 240-litre mobile garbage bin.

Organics generation – The average weight of organics bin was 10.65kg and ranged between 1 – 100% full with an average bin fullness of 19%.

Organics composition – Collectively food and green waste accounted for 94.8% of all material in the organics stream with food representing 29.4% and garden waste 65.4%. A further 2.7% comprised wood and straw and a further 1.6% comprised paper, cardboard and earth, all of which are fully compostable. The total organic fraction in the bin was 99.1%, an outstanding achievement. Mundaring recorded the highest amount of green waste (9.72kg) and Belmont had the highest amount of food waste (4.6kg) per household.

Contamination – The contamination rate was 0.9%, comprising plastics, metal, glass and nappies.

Total waste generation – Bayswater was the only council that had a garden waste bin prior to the trial commencing. The table below shows the average weight per household bin by type pre and post the trial. It can be seen that, on average, the total waste generated by these sample households increased from 16.3kg to 23.55kg per week.

In summary, the householders who participated embraced the trial, achieving a decrease in average garbage stream weight of 4.4kg with specific decreases in garden waste by 14.1% and food waste by 7.8%. However, total waste generated increased from 16.3kg to 23.55kg. his increase in total waste generation came directly from the organics stream which represented 10.65kg per household. Even in Bayswater where an existing green waste collection service already generated 5.9kg per household, the trial increased the amount of green waste collected to 11.2kg per household. Contamination was extremely low at 0.9%.

5. RESULTS

5.1 Regional Results – Pre Trial

5.1.1 Garbage Stream

The table below provides a summary of the garbage samples collected during the pre trial audit. Belmont recorded the highest average bin weight of 20.2kg, while Mundaring had the lowest average bin weight of 11.4kg. Bayswater, which already has a garden waste service recorded the second lowest average garbage bin weight at 11.6kg. The average garbage bin is 16.3kg. The amount of space occupied by waste in the garbage bins presented was recorded and ranges from 65% in Kalamunda to 90% in Mundaring. The average bin volume used across the region was 75%, indicating that on average of 25% of the garbage bin is free space.

Table 12 - Garbage Stream – Pre Trial

Council	Addresses visited	Bins presented	Median volume	Volume range	Average weight (kg)
Bassendean	50	44	85%	10% – 120%	15.8
Bayswater	52	45	55%	5% – 110%	11.6
Belmont	57	51	80%	5% – 110%	20.2
Kalamunda	58	50	65%	3% – 105%	18.6
Mundaring	50	47	90%	10% – 120%	11.4
Swan	56	50	75%	15% – 125%	20.1
Region	**323**	**287**	**75%**		**16.3**

The table below provides a summary of the garden waste samples collected in Bayswater pre the trial commencing. The average garden waste bin weighed 11.8kg and was 100% full. In some cases, bins were overflowing.

Table 13 - Bayswater Garden Waste – Pre Trial

Council	Addresses visited	Bins presented	Median volume	Volume range	Average weight (kg)
Bayswater	52	29	100%	10% – 120%	11.8

Bayswater Council is the only council offering a fortnightly garden waste service. The average garden waste bin weight has been divided by two to equate to a weekly generation amount and added to the weekly garbage amount to provide an indication of total waste generated for comparison purposes with the other councils and the post audit results. All other local councils are collecting garden waste in the garbage stream, which may account for higher average bin weights. When this combined amount is considered, Bayswater generates the third lowest waste generation rate.

Table 14 - Bayswater Total Waste Stream – Pre Trial

Council	Average weight per collection (kg)	Average weight per week (kg)
Garbage	11.6	11.6
Garden waste	11.8	5.9
Total	**23.4**	**17.5**

Weight and Composition of Garbage Pre Trial by Council – Chart 1 below provides a breakdown of the garbage stream in three key categories; 'green waste', 'food waste', and 'other'. The amount of organics available in the garbage stream ranged from 5.31kg at Mundaring to 11.65kg at Swan. Swan recorded the largest amount of food waste (7.95kg) and Kalamunda had the highest amount of green waste (7.21kg).

Chart 1 – Composition of Garbage Stream – Pre Trial by Council

(Kgs per household)

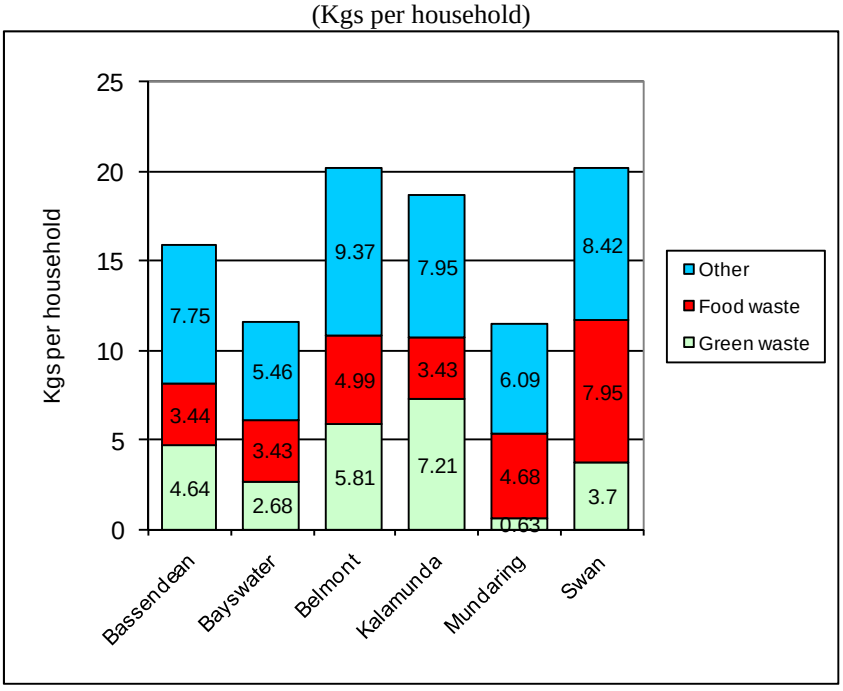


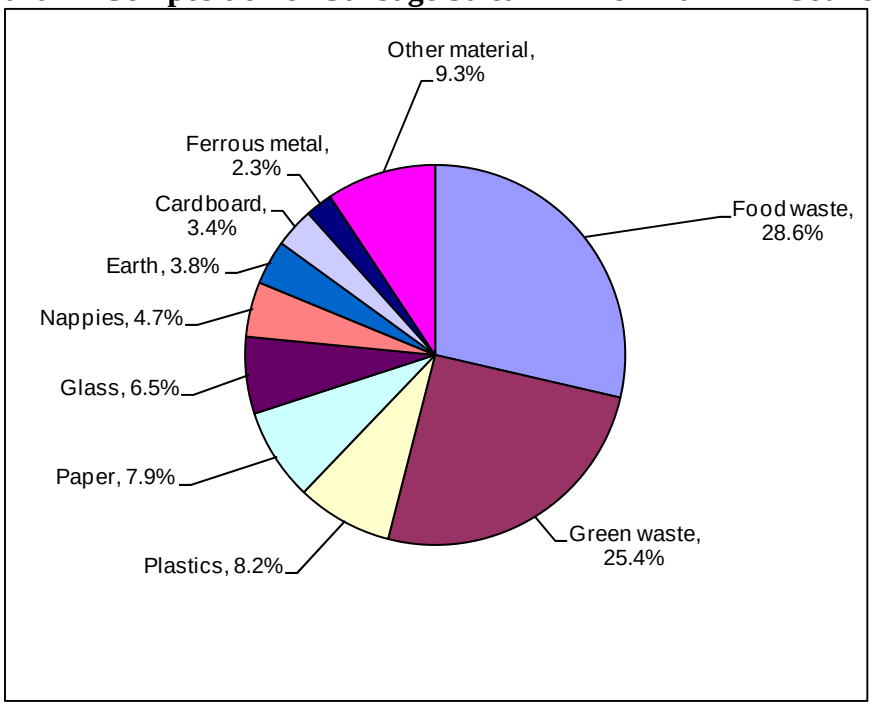
Table 15 below provides a breakdown of the contents of the garbage stream composition with organic food and green waste accounting for 54%.

Table 15 - Composition of Garbage Stream Pre Trial – All Councils Combined

Material	Weight (kg)	Per cent
Paper	370.4	7.9%
Cardboard	158.8	3.4%
Textiles – natural	60.2	1.3%
Textiles – synthetic	39.5	0.8%
Wood and straw	69.6	1.5%
Green waste	1,196.3	25.4%
Food waste	1,348.8	28.6%
Hazardous	3.2	0.1%
Other	208.3	4.4%
Miscellaneous	18.9	0.4%
Medical	4.5	0.1%
Earth	178.1	3.8%
Glass	308.5	6.5%
Plastics	384.4	8.2%
Ferrous metal	109.2	2.3%
Non-ferrous metal	35.1	0.7%
Nappies	220.5	4.7%
Total	**4,714.3**	**100.0%**

Chart 2 below illustrates the composition of the garbage stream for all councils combined as detailed in Table 15 above.

Chart 2 – Composition of Garbage Stream – Pre Trial – All Councils



Aggregated Garbage Stream Composition – Table 16 below consolidates each material into five key categories for ease of interpretation. If wood and straw are included as organics, the amount available to be diverted to the new organics service is 55%. In addition to the large volume of organic material (55%), nearly a third of the waste stream (29%) is recyclable material such as paper, cardboard and recyclable containers for which recycling services are offered in all councils' areas.

Table 16 – Aggregated Composition of Garbage Stream – Pre Trial – All Councils Combined

Material	Weight (kg)	Per cent
Recyclable material (1)	1366.4	29.0%
Textiles – natural and synthetic	99.7	2.1%
Organic material (2)	2614.7	55.5%
Hazardous/medical	7.7	0.2%
Other/miscellaneous	625.8	13.3%
Total	**4,714.3**	**100.0%**

1: Paper, cardboard, plastics, glass, ferrous and non-ferrous metal.
2: Wood and straw, green waste, food waste.

5.2 Regional Results – Post Trial

5.2.1 Garbage Stream

Table 15, provides details of the post trial collection of the garbage stream for each of the participating councils. Across all councils, the average garbage bin weight was 12.9kg for the post trial collection, a reduction of 3.4kgs. Belmont recorded the highest average bin weight of 16.5kg (down from 20.2kg) and Mundaring the lowest of 9.2kg (down from 11.4kg).

Table 17 – Garbage Stream – Post Trial

Council	Bins presented	Median volume	Volume range	Average weight (kg)
Bassendean	30	45%	5% – 100%	11.4
Bayswater (1)	14	45%	10% – 110%	15.3
Belmont (1)	16	55%	7% – 100%	16.5
Kalamunda	42	50%	15% – 110%	13.0
Mundaring	38	90%	20% – 115%	9.2
Swan	31	60%	15% – 110%	12.1
Regional	**171**	**57.5%**		**12.9**

It should be noted here that the number of bins presented and collected is much lower than the 287 in the pre audit, due mostly to a number of bins being already emptied by the collection contractor prior to the audit team arriving to collect the sample. A more detailed explanation for this anomaly is provided in the individual council analysis in the council areas where this occurred.

Tables 19 & 20 that accompany Chart 3 collectively illustrate the composition of the garbage stream across all councils in the post trial sample. Organic material represented 32.3%, a decrease of 21.7% from the pre audit with food waste at 20.8% and garden waste comprising 11.3%.

Table 18 - Composition of Garbage Stream Post Trial– All Councils Combined

Material	Weight (kg)	Per cent
Paper	231.5	11.1%
Cardboard	107.4	5.1%
Textiles – natural	48.4	2.3%
Textiles – synthetic	25.0	1.2%
Wood and straw	117.8	5.6%
Green waste	236.7	11.3%
Food waste	435.1	20.8%
Hazardous	4.2	0.2%
Other	123.1	5.9%
Miscellaneous	55.9	2.7%
Medical	7.1	0.3%
Earth	143.9	6.9%
Glass	115.1	5.5%
Plastics	228.2	10.9%
Ferrous metal	40.2	1.9%
Non-ferrous metal	18.2	0.9%
Nappies	155.2	7.4%
Total	**2,093.0**	**100.0%**

Chart 3 – Composition of Garbage Stream – Post Trial –All Councils Combined

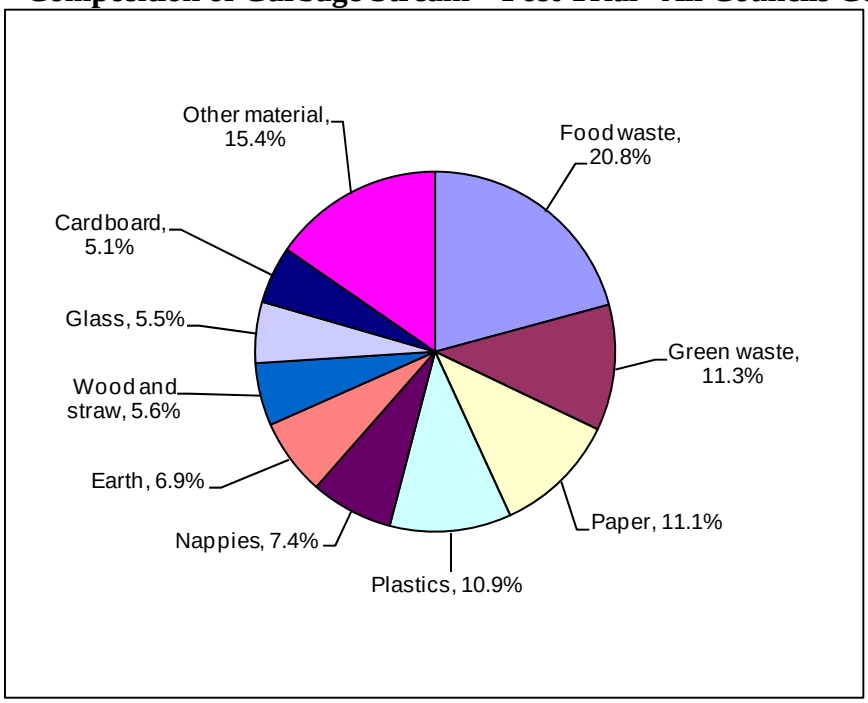


Table 19 - Aggregated Composition of Garbage Stream – Post Trial – All Councils Combined

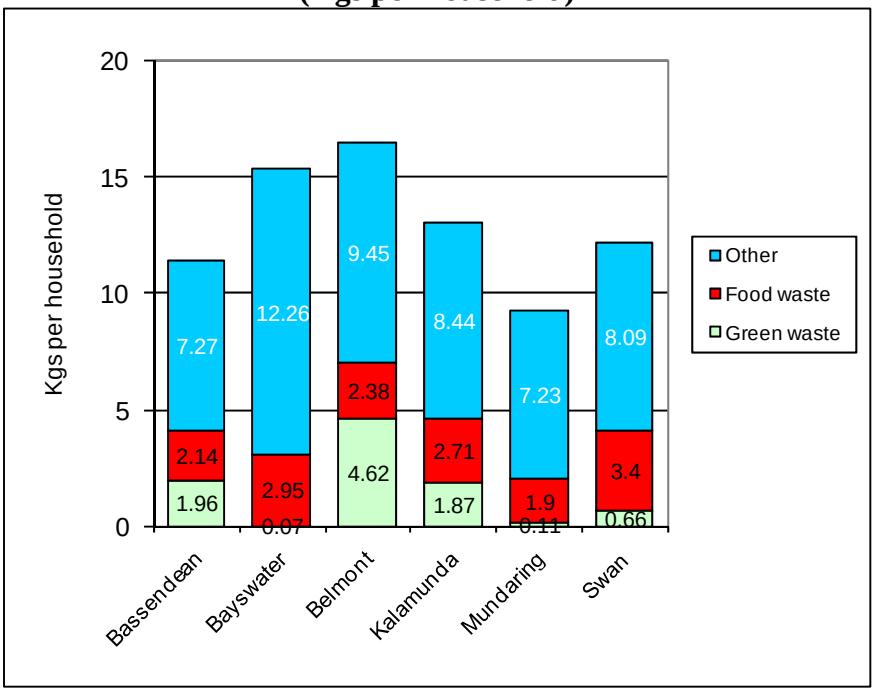
Material	Weight (kg)	Per cent
Recyclable material (1)	740.6	35.4%
Textiles – natural and synthetic	73.4	3.5%
Organic material (2)	789.6	37.7%
Hazardous/medical	11.3	0.5%
Other/miscellaneous	478.1	22.8%
Total	**2,093.0**	**100.0%**

1: Paper, cardboard, plastics, glass, ferrous and non-ferrous metal.

2: Wood and straw, green waste, food waste.

Weight and Composition of Garbage Stream Post Trial by Council – Chart 4 illustrates the waste stream composition by food waste, green waste and 'other' for each participating council. The 'other' component is now the greatest in all cases. Belmont recorded the largest amount of green waste (4.62kgs) still in the garbage stream per household per week and Swan recorded the largest amount of food waste (3.4kg) per household per week.

Chart 4 – Weight and Composition Of Garbage Stream Post Trial by Council (Kgs per household)



5.2.2 Organic Waste Collection

Table 20 below shows the actual number of bins presented for collection in each council area along with the volume and average weight per household. The average weight of organic waste was 10.65kg per household.

Table 20 - Organic Waste Collection Trial

Council	Bins presented	Median volume	Volume range	Average weight (kg)
Bassendean	31	5%	1% – 100%	6.6
Bayswater	22	20%	1% – 110%	11.2
Belmont	31	30%	1% – 100%	13.0
Kalamunda	42	5%	1% – 110%	11.6
Mundaring	40	50%	1% – 110%	14.2
Swan	32	5%	1% – 100%	7.3
Total	**198**	**19%**		**10.65**

Bin volume used ranged from 1% – 110% as can be seen in the photographs below:

APC's audit supervisor recorded the participation rate in Mundaring to be the best of the councils that took part in the trial. He also observed that most of the organic bins only had a small amount of 'bio-bags'/food in them with little green waste. In some cases, garden waste was obvious in the garbage bins, suggesting some confusion among residents as to what should be placed where. In most cases where bin volumes that were less than 5% full our supervisor observed green waste in the garbage bin. Organics bins with greater than 20% fullness contained mostly green waste with little food waste evident.

Tables 21, 22 and accompanying Chart 5 below shows the composition of the organic stream for all councils.

Table 21 shows that the majority of the organics stream was green waste, representing 65.4% of the total, followed by food waste at 29.4%. Collectively food and green waste accounted for 95% of all material.

Table 21 - Composition Of Organic Stream –All Councils Combined

Material	Weight (kg)	Per cent
Paper	10.8	0.5%
Cardboard	16.3	0.8%
Textiles – natural	0.2	0.0%
Textiles – synthetic	1.2	0.1%
Wood and straw	58.8	2.7%
Green waste	1,402.1	65.4%
Food waste	630.5	29.4%
Hazardous	0.0	0.0%
Other	0.2	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	5.9	0.3%
Glass	3.6	0.2%
Plastics	10.9	0.5%
Ferrous metal	1.1	0.1%
Non-ferrous metal	0.9	0.0%
Nappies	3.0	0.1%
Total	**2,145.5**	**100.0%**

In Table 22 shows the aggregated composition, organic material represents 97.5%, indicating that just 2.5% contamination was present in the organic bins, which is an excellent result. However, 1.6% of the contamination is organic matter such as paper, earth and cardboard so the true contamination rate is less then 1%.

Table 22 - Aggregated Composition of Organic Stream – All Councils Combined

Material	Weight (kg)	Per cent
Recyclable material (1)	43.6	2.0%
Textiles – natural and synthetic	1.4	0.1%
Organic material (2)	2,091.4	97.5%
Hazardous/medical	0.0	0.0%
Other/miscellaneous	9.1	0.4%
Total	**2,145.5**	**100.0%**

1: Paper, cardboard, plastics, glass, ferrous and non-ferrous metal.

2: Wood and straw, green waste, food waste.

Chart 5 – All Councils Combined – Composition of Trial Organic Stream

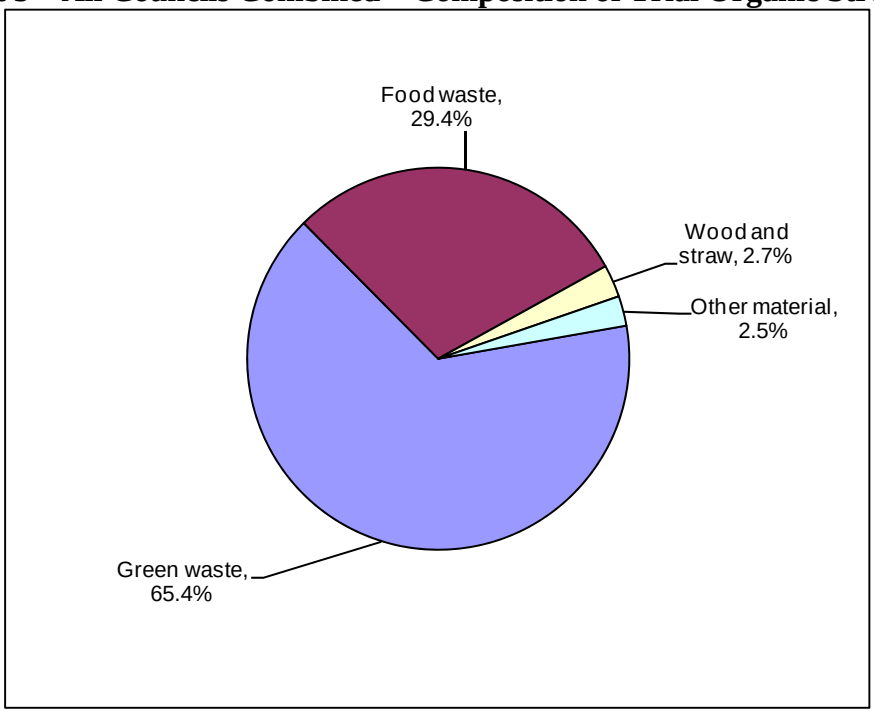


Chart 6 below illustrates the weight and composition of the organic waste stream collected, by council. The waste is categorised as food waste, green waste or 'other'. Mundaring recorded the highest amount of green waste (9.72kg) and Belmont had the highest amount of food waste (4.6kg) per household.

Chart 6 – Weight And Composition Of Trial Organic Waste By Council (Kgs per household)

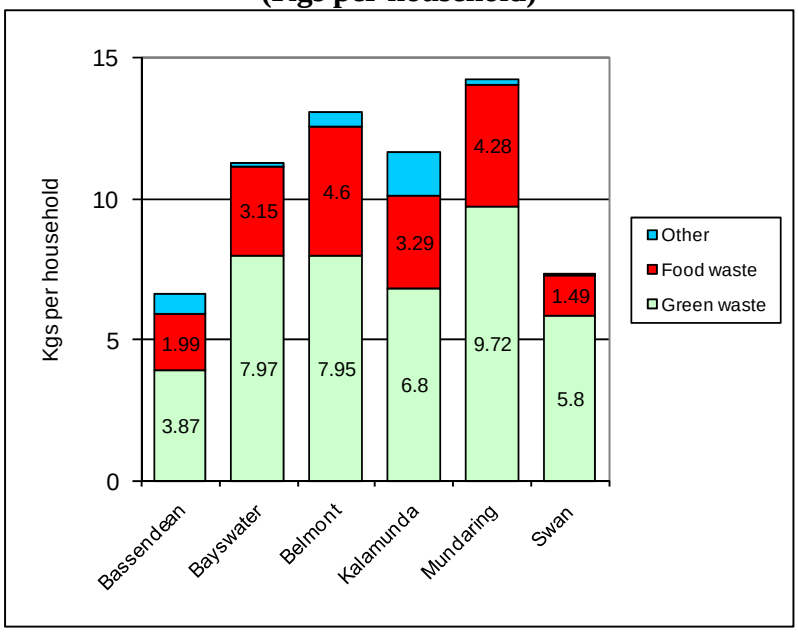


Table 23 below shows the percentage of green, food and other waste in the organics stream for each council.

Table 23 - Proportion Of Green And Food Waste In Trial Organics Bin Individual Councils

Council	Green waste	Food waste	Other material
Bassendean	58.6%	30.1%	11.4%
Bayswater	70.9%	28.1%	1.0%
Belmont	61.0%	35.3%	3.7%
Kalamunda	58.5%	28.3%	13.2%
Mundaring	68.6%	30.1%	1.3%
Swan	79.4%	20.5%	0.1%
All councils	**65.4%**	**29.4%**	**5.3%**

Table 24 below provides a comparison of the components of garbage stream pre and post trial, for all councils combined. Note that the proportion of green waste in the garbage dropped from 25.4% pre trial to 11.3% post trial, a change of 14.1%, while the proportion of food waste dropped from 28.6% to 20.8%, a change of 7.8%.

Table 24 - Composition of Garbage Stream – Pre and Post Trial – All Councils

Material	Pre	Post	Change
Paper	7.9%	11.1%	3.2%
Cardboard	3.4%	5.1%	1.7%
Textiles – natural	1.3%	2.3%	1.0%
Textiles – synthetic	0.8%	1.2%	0.4%
Wood and straw	1.5%	5.6%	4.1%
Green waste	25.4%	11.3%	–14.1%
Food waste	28.6%	20.8%	–7.8%
Hazardous	0.1%	0.2%	0.1%
Other	4.4%	5.9%	1.5%
Miscellaneous	0.4%	2.7%	2.3%
Medical	0.1%	0.3%	0.2%
Earth	3.8%	6.9%	3.1%
Glass	6.5%	5.5%	–1.0%
Plastics	8.2%	10.9%	2.7%
Ferrous metal	2.3%	1.9%	–0.4%
Non-ferrous metal	0.7%	0.9%	0.2%
Nappies	4.7%	7.4%	2.7%
Total	**100.0%**	**100.0%**	**–**

Table 25 - Total Waste Stream – Pre and Post Trial

Council	Pre Audit		Post Audit		
	Garbage	Organics	Garbage	Organics	Total Waste Stream
	Weight kgs per household per week				
Bassendean	15.8	N/A	11.4	6.6	18
Bayswater	11.6	5.9	15.3	11.2	26.5
Belmont	20.2	N/A	16.5	13.0	29.5
Kalamunda	18.6	N/A	13.0	11.6	24.6
Mundaring	11.4	N/A	9.2	14.2	23.4
Swan	20.1	N/A	12.1	7.3	19.4
Average Household	**16.3**	**5.9**	**12.9**	**10.65**	**23.55**

Table 26 provides a comparison of the proportions of green waste in the garbage stream pre and post trial for each council. Overall, a decrease of 14.1% was recorded.

Table 26 - Proportion of Green Waste in Garbage – Pre And Post Trial Individual Councils

Council	Pre	Post	Change
Bassendean	29.3%	17.2%	–12.1%
Bayswater	23.2%	0.5%	–22.7%
Belmont	28.8%	28.1%	–0.7%
Kalamunda	38.8%	14.3%	–24.5%
Mundaring	5.5%	1.2%	–4.3%
Swan	18.4%	5.4%	–13.0%
All councils	**25.4%**	**11.3%**	**–14.1%**

Every council shows a reduction, which is graphically shown in Chart 7 below with the greatest in Kalamunda Council, which dropped by 24.5 percentage points and Bayswater by 22.7 percentage points.

Chart 7 – Proportion Of Green Waste In Garbage- Pre And Post Trial Individual Councils

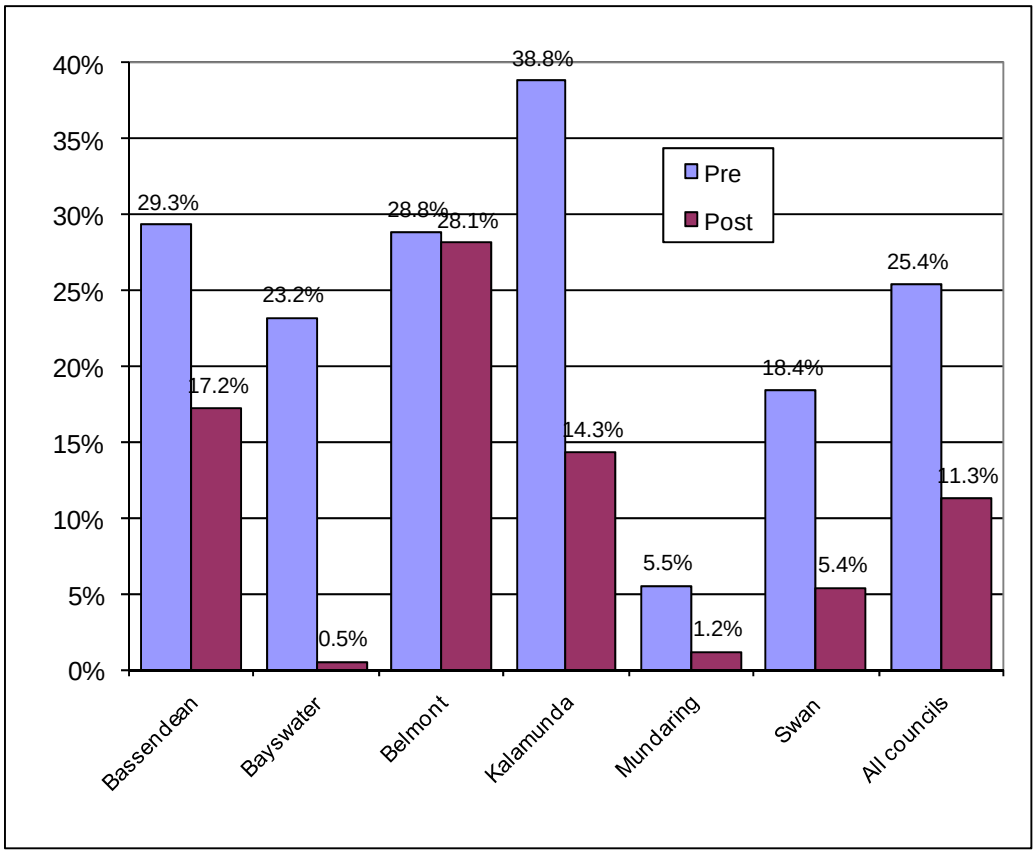


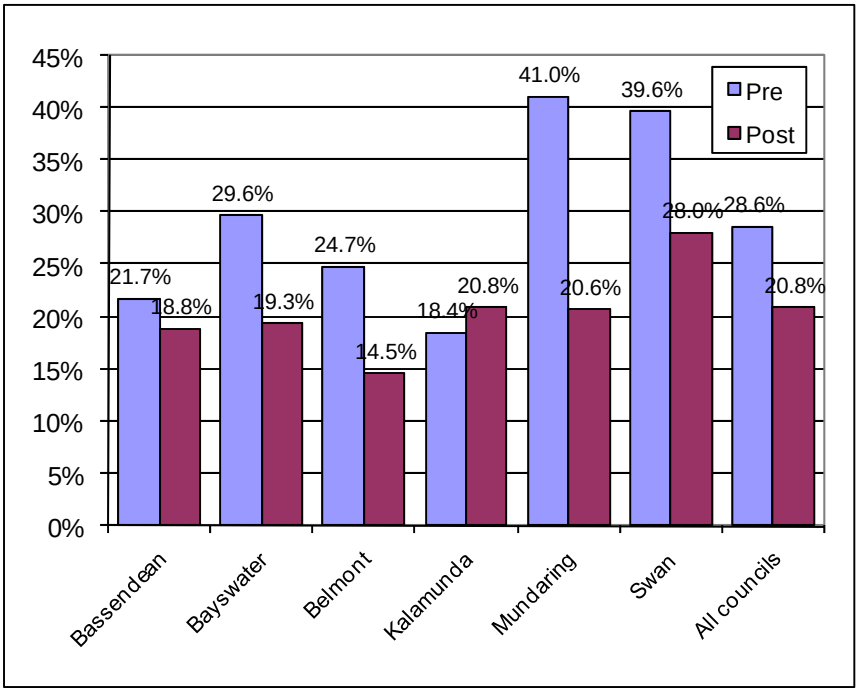
Table 27 provides a comparison of the proportions of food waste in the garbage stream pre and post trial for each council. Overall, a decrease of 7.8% was recorded.

Table 27 - Proportion of Food Waste in Garbage – Pre And Post Trial Individual Councils

Council	Pre	Post	Change
Bassendean	21.7%	18.8%	–2.9%
Bayswater	29.6%	19.3%	–10.3%
Belmont	24.7%	14.5%	–10.2%
Kalamunda	18.4%	20.8%	2.4%
Mundaring	41.0%	20.6%	–20.4%
Swan	39.6%	28.0%	–11.6%
All councils	**28.6%**	**20.8%**	**–7.8%**

Five councils showed a reduction, with the greatest in Mundaring Council, which dropped by 20.4 percentage points, followed by Swan with 11.6 percentage points. Only Kalamunda showed an increase with 2.4 percentage points.

Chart 8 – Proportion of Food Waste in Garbage – Pre And Post Trial Individual Councils



6. MEMBER COUNCIL RESULTS

6.1 Town of Bassendean

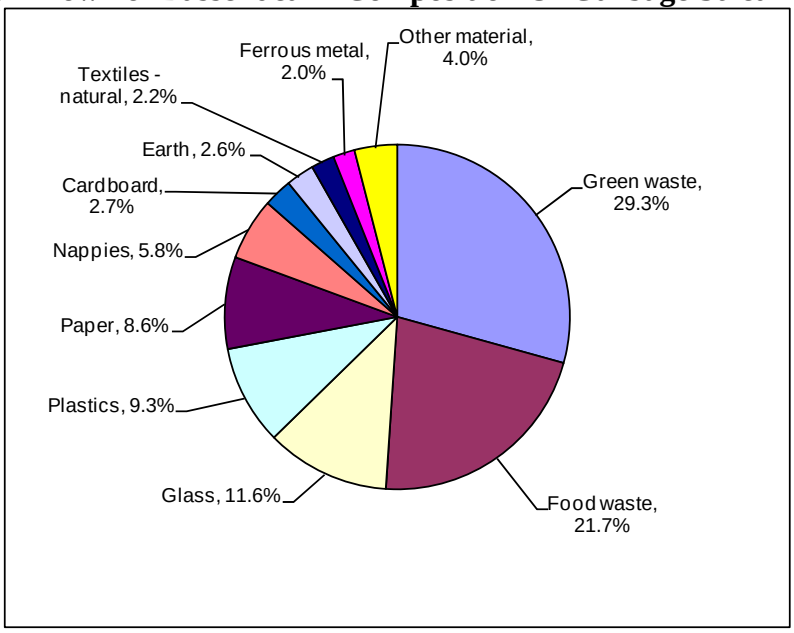
6.1.1 Pre Trial

Table 28 and accompanying Chart 9 show the composition of the waste stream for the Town of Bassendean pre trial. In this sample, green and food waste accounted for 29.3% and 21.7% respectively.

Table 28 - Town of Bassendean – Composition of Garbage Stream – Pre Trial

Material	Weight (kg)	Per cent
Paper	60.1	8.6%
Cardboard	18.7	2.7%
Textiles – natural	15.2	2.2%
Textiles – synthetic	5.4	0.8%
Wood and straw	1.6	0.2%
Green waste	204.2	29.3%
Food waste	151.5	21.7%
Hazardous	0.0	0.0%
Other	9.8	1.4%
Miscellaneous	6.6	0.9%
Medical	0.2	0.0%
Earth	18.3	2.6%
Glass	80.9	11.6%
Plastics	65.1	9.3%
Ferrous metal	14.1	2.0%
Non-ferrous metal	4.3	0.6%
Nappies	40.7	5.8%
Total	**696.7**	**100.0%**

Chart 9 – Town of Bassendean– Composition Of Garbage Stream Pre Trial



6.1.2 Post Trial

Table 29 and accompanying Chart 10 show the waste stream composition post trial. In this sample, the proportion of green waste dropped to 17.2% and food waste to 18.8%.

Table 29 - Town of Bassendean– Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	35.7	10.5%
Cardboard	46.5	13.6%
Textiles – natural	7.3	2.1%
Textiles – synthetic	2.9	0.8%
Wood and straw	3.7	1.1%
Green waste	58.8	17.2%
Food waste	64.2	18.8%
Hazardous	0.5	0.1%
Other	8.4	2.5%
Miscellaneous	9.8	2.9%
Medical	0.0	0.0%
Earth	11.5	3.4%
Glass	19.8	5.8%
Plastics	37.8	11.1%
Ferrous metal	7.1	2.1%
Non-ferrous metal	3.6	1.1%
Nappies	23.6	6.9%
Total	**341.2**	**100.0%**

NB: 'Other' included – soap, electrical wiring, ceramics and electronic equipment.
'Miscellaneous' included – plaster scrap, kitty litter.

Chart 10 – Town of Bassendean– Composition Of Garbage Stream Post Trial

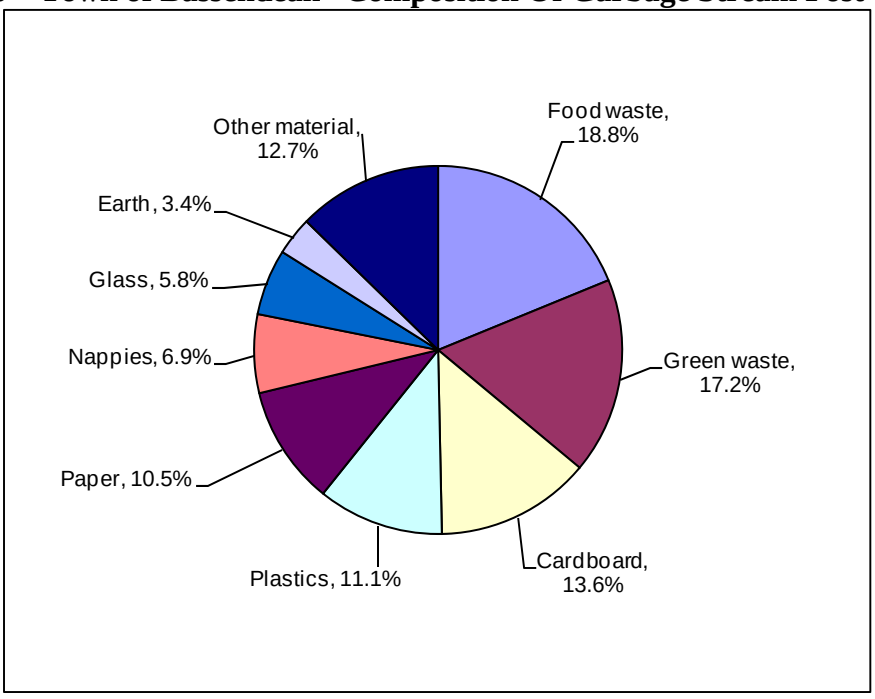
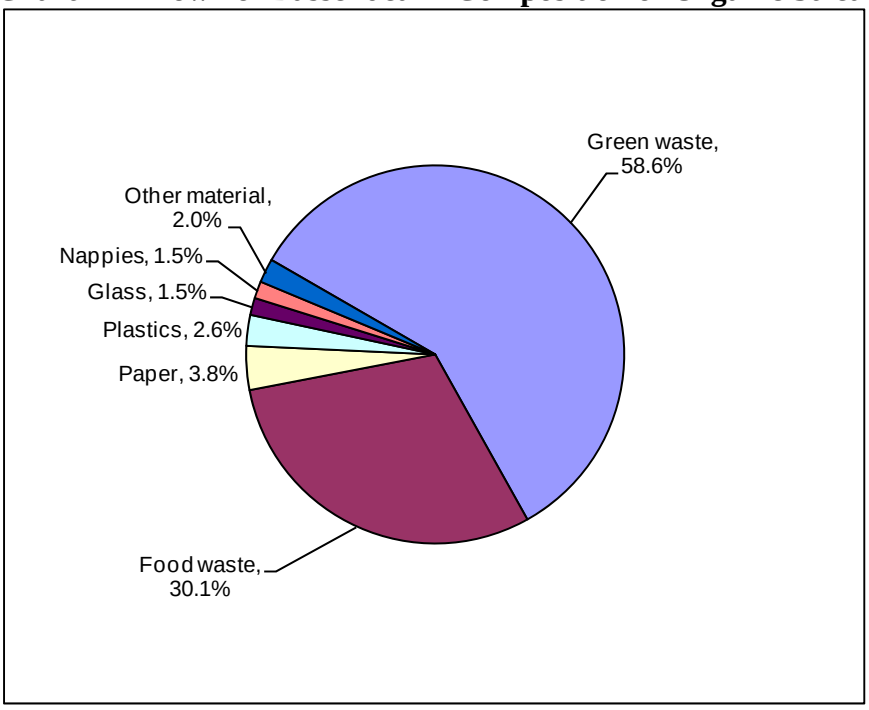


Table 30 and the accompanying Chart 11 show the composition of the organic stream from the trial sample. Collectively, food and green waste accounted for 88.7% of all material with paper representing also 3.8%. The remaining 7.5% contamination comprised of plastics, glass and nappies.

Table 30 - Town of Bassendean– Composition Of Trial Organic Stream

Material	Weight (kg)	Per cent
Paper	7.7	3.8%
Cardboard	2.1	1.0%
Textiles – natural	0.1	0.0%
Textiles – synthetic	0.3	0.1%
Wood and straw	0.1	0.0%
Green waste	120.1	58.6%
Food waste	61.7	30.1%
Hazardous	0.0	0.0%
Other	0.0	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	3.0	1.5%
Plastics	5.4	2.6%
Ferrous metal	1.0	0.5%
Non-ferrous metal	0.6	0.3%
Nappies	3.0	1.5%
Total	**205.1**	**100.0%**

Chart 11 – Town of Bassendean– Composition of Organic Stream



6.2 City of Bayswater

6.2.1 Pre Trial

Table 31 and accompanying Chart 12 show the composition of the waste stream for the City of Bayswater pre trial. In this sample, green and food waste accounted for 23.2% and 29.6% respectively, as this council already had a separate organics collection program in place prior to the commencement of this trial.

Table 31 - City of Bayswater– Composition Of Garbage Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	53.3	10.2%
Cardboard	21.3	4.1%
Textiles – natural	3.8	0.7%
Textiles – synthetic	0.1	0.0%
Wood and straw	10.3	2.0%
Green waste	120.6	23.2%
Food waste	154.3	29.6%
Hazardous	0.3	0.1%
Other	20.0	3.8%
Miscellaneous	0.4	0.1%
Medical	1.1	0.2%
Earth	17.1	3.3%
Glass	30.4	5.8%
Plastics	55.3	10.6%
Ferrous metal	12.2	2.3%
Non-ferrous metal	3.3	0.6%
Nappies	17.0	3.3%
Total	**520.8**	**100.0%**

Chart 12 – City of Bayswater– Composition of Garbage Stream Pre Trial

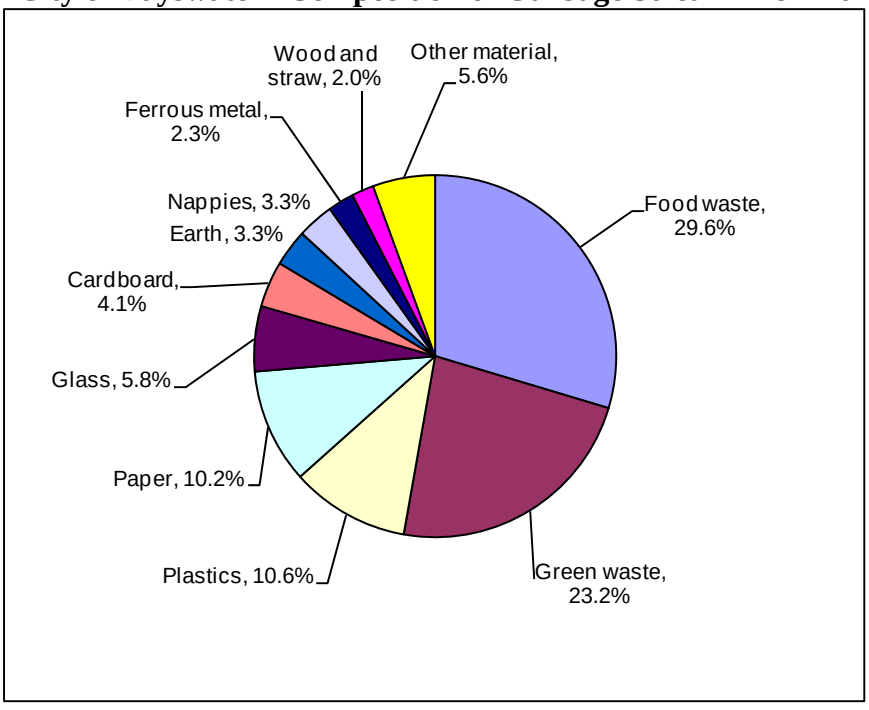
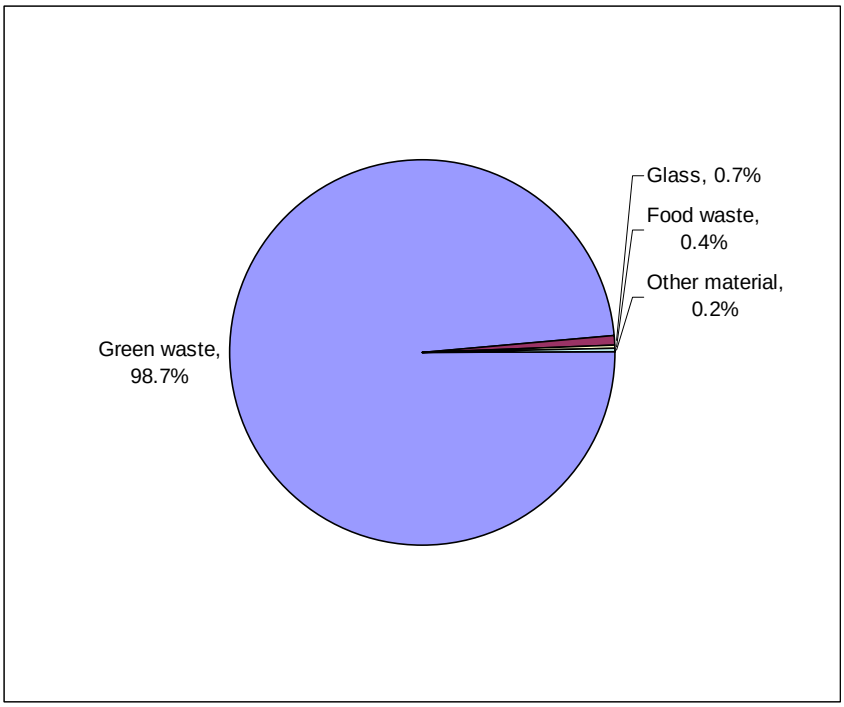


Table 32 shows the composition of the green waste stream pre trial and highlights the existing, efficient use of this service for garden waste, which accounts for 98.7% of the total sample with contamination just 1.3%.

Table 32 - City of Bayswater– Composition Of Green Waste Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	0.0	0.0%
Cardboard	0.2	0.1%
Textiles – natural	0.0	0.0%
Textiles – synthetic	0.0	0.0%
Wood and straw	0.0	0.0%
Green waste	337.8	98.7%
Food waste	1.5	0.4%
Hazardous	0.0	0.0%
Other	0.0	0.0%
Miscellaneous	0.2	0.1%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	2.4	0.7%
Plastics	0.2	0.1%
Ferrous metal	0.0	0.0%
Non-ferrous metal	0.0	0.0%
Nappies	0.0	0.0%
Total	**342.3**	**100.0%**

Chart 13 – City of Bayswater– Composition of Organics Stream Pre Trial



6.2.2 Post Trial

Collection Issues – On the Wednesday collection in Rosebery Street, the Cleanaway collection vehicle had already collected half of the proposed sample by 7:30am when APC arrived to collect the bin contents. This occurred despite APC's audit supervisor being advised by the Cleanaway supervisor that the truck would not collect in that area until after 9am. After conferring with Stephen Fitzpatrick, it was decided to collect all of the available organics bins even if their accompanying garbage bin had been collected by Cleanaway. Table 33 and the accompanying Chart 13 below show the garbage stream composition for the post trial sample. Green waste accounts for only 0.5% of this sample. Food waste and earth were the two single largest components, accounting for 19.3% and 16.7% respectively.

Table 33 - City of Bayswater– Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	13.2	6.2%
Cardboard	8.7	4.1%
Textiles – natural	10.5	4.9%
Textiles – synthetic	8.7	4.1%
Wood and straw	4.5	2.1%
Green waste	1.0	0.5%
Food waste	41.3	19.3%
Hazardous	0.4	0.2%
Other	40.8	19.1%
Miscellaneous	7.3	3.4%
Medical	0.9	0.4%
Earth	35.7	16.7%
Glass	11.0	5.1%
Plastics	21.7	10.1%
Ferrous metal	5.8	2.7%
Non-ferrous metal	1.9	0.9%
Nappies	0.6	0.3%
Total	**214.0**	**100.0%**

Chart 14 – City of Bayswater– Composition of Garbage Stream Post Trial

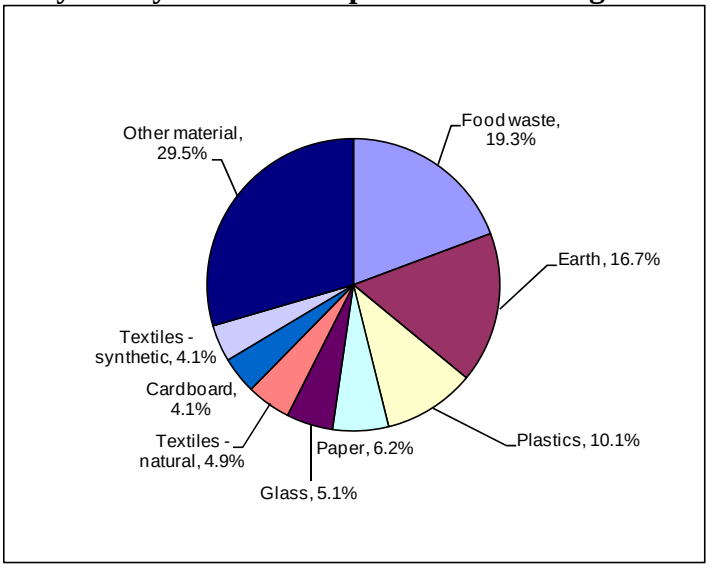
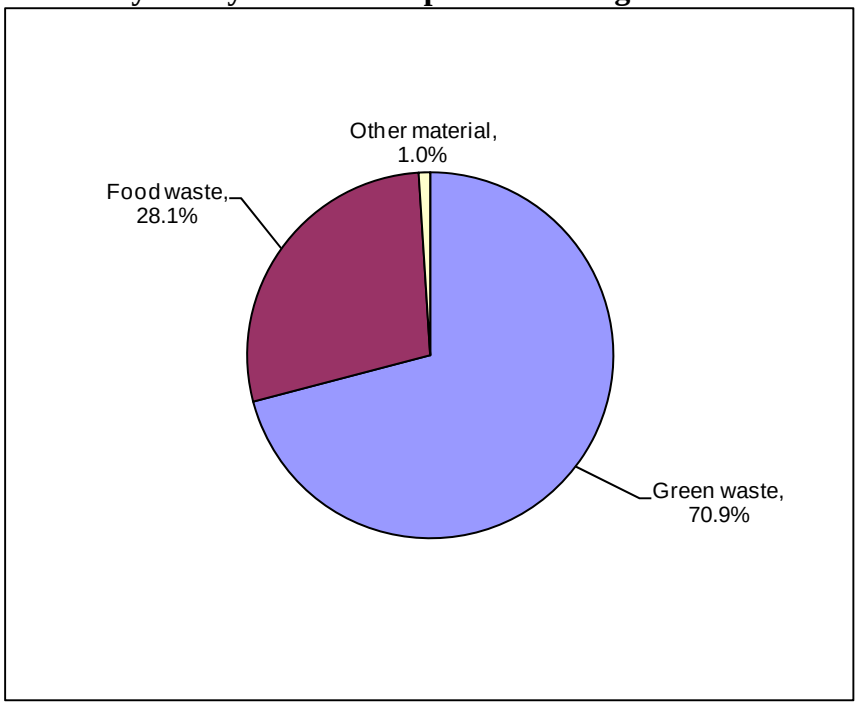


Table 34 and accompanying Chart 15 show the composition of the organics stream. Green and food waste account for 99% of the sample, which represents exceptional performance with contamination of less then 0.5**%** comprising plastics, textiles and glass.

Table 34 - City of Bayswater – Composition of Organics Stream

Material	Weight (kg)	Per cent
Paper	0.8	0.3%
Cardboard	0.2	0.1%
Textiles – natural	0.0	0.0%
Textiles – synthetic	0.6	0.2%
Wood and straw	0.0	0.0%
Green waste	175.4	70.9%
Food waste	69.4	28.1%
Hazardous	0.0	0.0%
Other	0.1	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	0.2	0.1%
Plastics	0.6	0.2%
Ferrous metal	0.0	0.0%
Non-ferrous metal	0.0	0.0%
Nappies	0.0	0.0%
Total	**247.3**	**100.0%**

Chart 15 – City of Bayswater– Composition of Organics Stream



6.3 City of Belmont

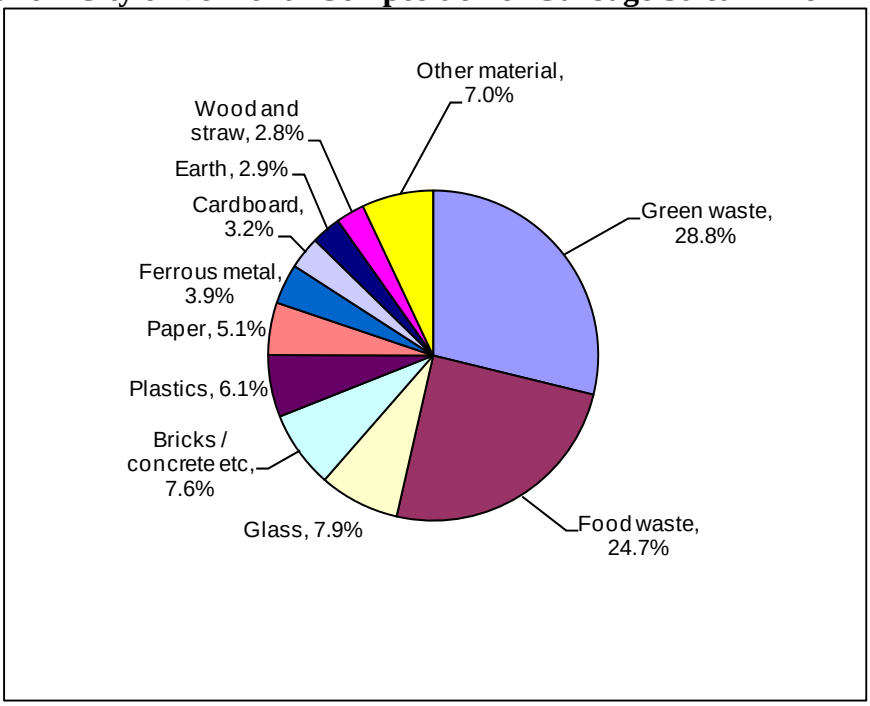
6.3.1 Pre Trial

Table 35 and accompanying Chart 16 show the composition of the garbage stream for the City of Belmont pre trial. In this sample, green and food waste accounted for 28.8% and 24.7% respectively.

Table 35 - City of Belmont– Composition Of Garbage Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	52.8	5.1%
Cardboard	32.6	3.2%
Textiles – natural	8.5	0.8%
Textiles – synthetic	7.0	0.7%
Wood and straw	28.7	2.8%
Green waste	296.4	28.8%
Food waste	254.4	24.7%
Hazardous	1.1	0.1%
Other	35.1	3.4%
Miscellaneous	0.8	0.1%
Medical	0.3	0.0%
Earth	30.0	2.9%
Glass	80.9	7.9%
Plastics	62.4	6.1%
Ferrous metal	40.5	3.9%
Non-ferrous metal	9.3	0.9%
Nappies	9.9	1.0%
Bricks/concrete/tiles/rubble	77.8	7.6%
Total	**1,028.5**	**100.0%**

Chart 16 – City of Belmont– Composition of Garbage Stream Pre Trial



6.3.2 Post Trial

Collection Issues – The organics sample was not collected in Kewdale during the prior week and, as a result, the organics sample collected for the post audit contained two weeks' worth of organics while the garbage stream represented just one week. The analysis has been adjusted accordingly to reflect this. In addition, half of the trial households had already been serviced by the time the audit team arrived. It was agreed to collect all of the available organics bins even if their accompanying garbage bin had already been serviced.

Table 36 and the accompanying Chart 17 below show the garbage stream composition in the post trial sample. Wood and straw made up the largest single component at 28.4% and the supervisor noted a number of bins contained a large amount of sawdust, which seemed to be spread through a number of garbage bins and therefore it is highly unlikely to be typical. Green waste represented 28.1% and food waste accounted for 14.5%.

Table 36 - City of Belmont– Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	13.7	5.2%
Cardboard	7.9	3.0%
Textiles – natural	1.6	0.6%
Textiles – synthetic	2.9	1.1%
Wood and straw	74.8	28.4%
Green waste	73.9	28.1%
Food waste	38.1	14.5%
Hazardous	0.2	0.1%
Other	9.6	3.6%
Miscellaneous	2.2	0.8%
Medical	0.6	0.2%
Earth	8.5	3.2%
Glass	10.4	4.0%
Plastics	12.9	4.9%
Ferrous metal	1.6	0.6%
Non-ferrous metal	0.5	0.2%
Nappies	3.8	1.4%
Total	**263.2**	**100.0%**

NB: 'Other' comprised – batteries, chemicals, asbestos/fibre, gyprock, paint rollers, outdoor lighting, electronic items, mats/rugs, mops, photo albums and bags.
'Medical' comprised – creams and tablets.

Chart 17 – City of Belmont– Composition of Garbage Stream Post Trial

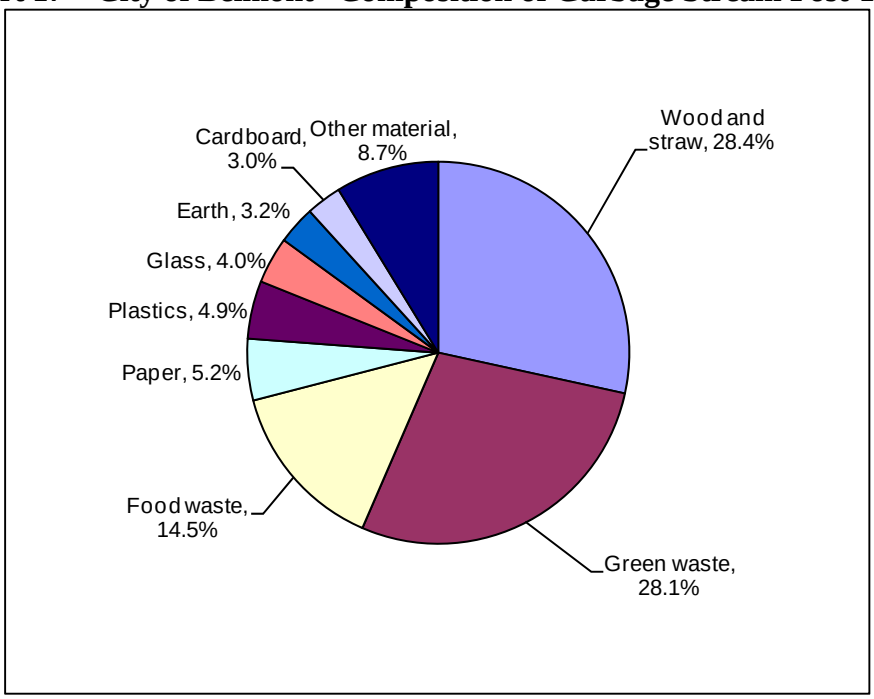
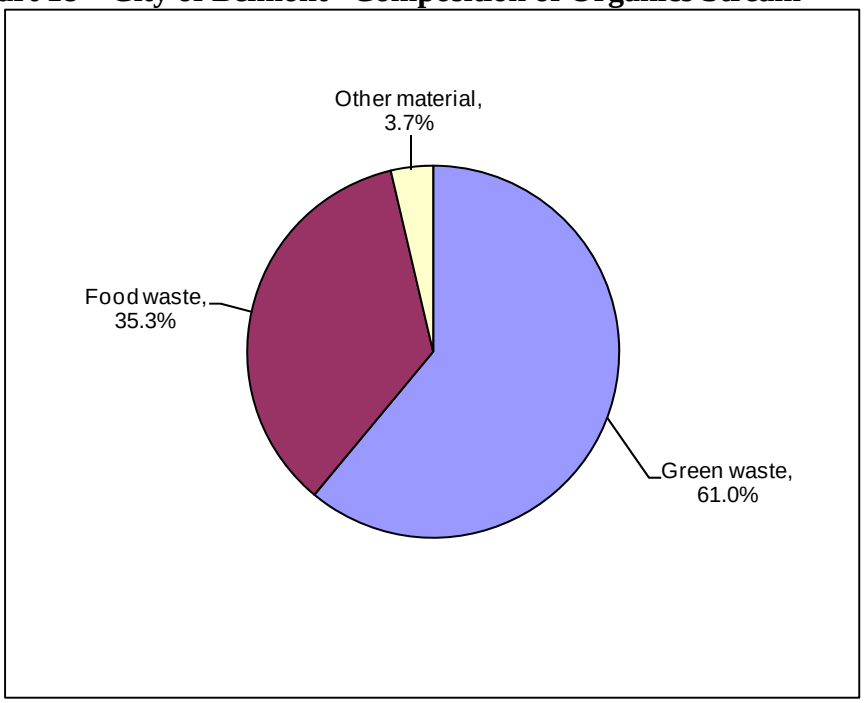


Table 37 and accompanying Chart 18 show the composition of the organics stream for Belmont. Green and food waste accounted for more than 94% of all material present in the bins. The majority of the remaining material was cardboard (3.4%).

Table 37 - City of Belmont– Composition of Organics Stream

Material	Weight (kg)	Per cent
Paper	0.0	0.0%
Cardboard	13.7	3.4%
Textiles – natural	0.0	0.0%
Textiles – synthetic	0.0	0.0%
Wood and straw	0.0	0.0%
Green waste	246.3	61.0%
Food waste	142.5	35.3%
Hazardous	0.0	0.0%
Other	0.1	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	0.0	0.0%
Plastics	0.7	0.2%
Ferrous metal	0.0	0.0%
Non-ferrous metal	0.3	0.1%
Nappies	0.0	0.0%
Total	**403.6**	**100.0%**

Chart 18 – City of Belmont– Composition of Organics Stream



6.4 Shire of Kalamunda

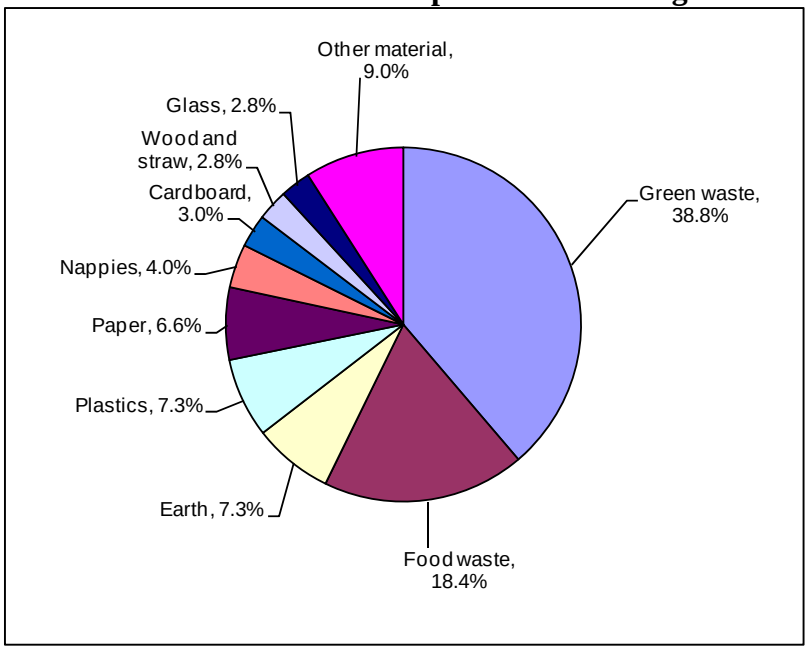
6.4.1 Pre Trial

Table 38 and accompanying Chart 19 show the composition of the waste stream for the Shire of Kalamunda pre trial. In this sample, green and food waste accounted for 38.8% and 18.4% respectively.

Table 38 - Shire of Kalamunda – Composition of Garbage Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	61.4	6.6%
Cardboard	27.9	3.0%
Textiles – natural	11.3	1.2%
Textiles – synthetic	8.0	0.9%
Wood and straw	26.3	2.8%
Green waste	360.6	38.8%
Food waste	171.4	18.4%
Hazardous	0.7	0.1%
Other	31.9	3.4%
Miscellaneous	5.8	0.6%
Medical	1.3	0.1%
Earth	67.8	7.3%
Glass	25.8	2.8%
Plastics	67.6	7.3%
Ferrous metal	16.5	1.8%
Non-ferrous metal	8.4	0.9%
Nappies	37.0	4.0%
Total	**929.7**	**100.0%**

Chart 19 – Shire of Kalamunda– Composition of Garbage Stream Pre Trial



6.4.2 Post Trial

Table 39 and accompanying Chart 20 below show the waste stream composition for the post trial sample. Green waste accounted for 14.3% of this sample. Food waste accounted for 20.8%, which was the single largest component of the waste stream.

Table 39 - Shire of Kalamunda– Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	46.4	8.5%
Cardboard	18.3	3.3%
Textiles – natural	7.4	1.4%
Textiles – synthetic	4.3	0.8%
Wood and straw	27.2	5.0%
Green waste	78.4	14.3%
Food waste	113.8	20.8%
Hazardous	1.0	0.2%
Other	31.6	5.8%
Miscellaneous	17.1	3.1%
Medical	3.4	0.6%
Earth	41.6	7.6%
Glass	30.0	5.5%
Plastics	60.4	11.0%
Ferrous metal	12.4	2.3%
Non-ferrous metal	4.7	0.9%
Nappies	48.8	8.9%
Total	**546.8**	**100.0%**

NB: 'Misc' comprised – fluoro tubes, grease, chemicals and batteries.
'Other' comprised – electronic equipment, fibre and ceramic material.
'Medical' – tablets and creams.
'Earth' – concrete and bricks.

Chart 20 – Shire of Kalamunda– Composition of Garbage Stream Post Trial

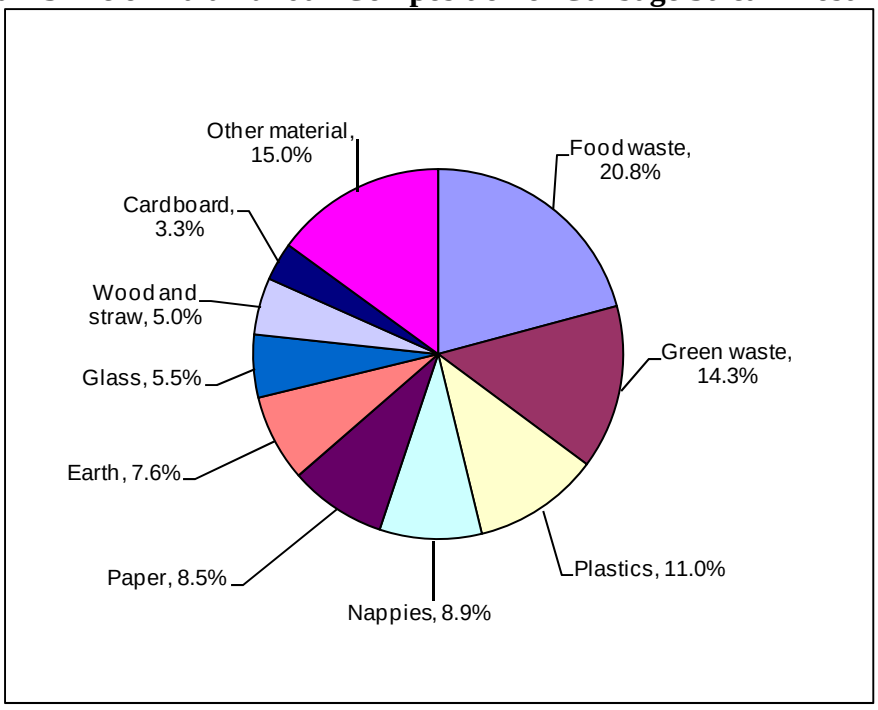
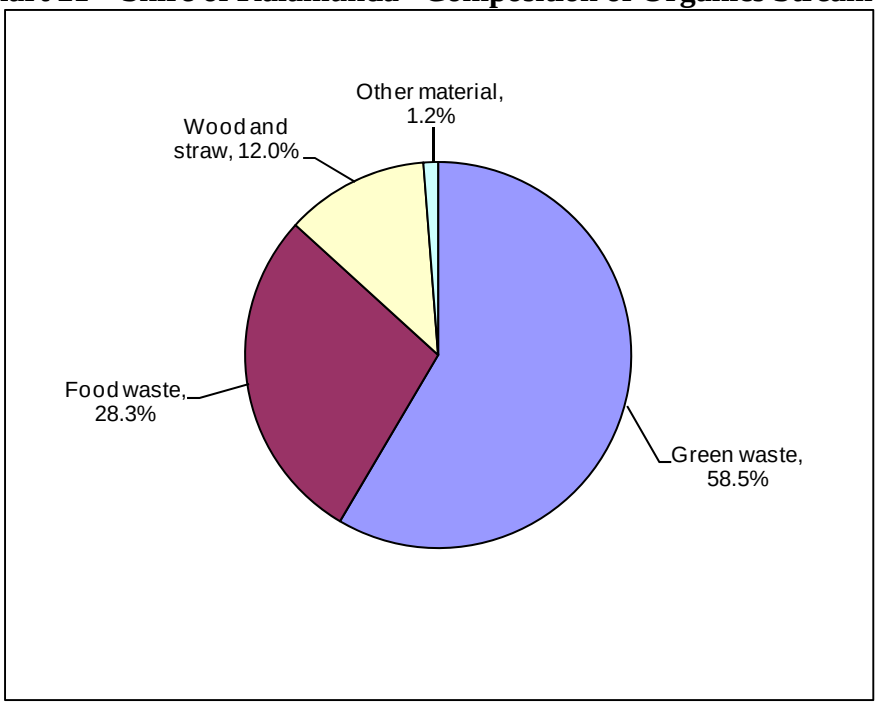


Table 40 and accompanying chart 21 show the composition of the organics stream from the trial. Collectively food and green waste accounted for approximately 86% and wood and straw representing a further 12%. Contamination was les then 1% comprising plastics.

Table 40 - Shire of Kalamunda– Composition of Organics Stream

Material	Weight (kg)	Per cent
Paper	1.9	0.4%
Cardboard	0.1	0.0%
Textiles – natural	0.1	0.0%
Textiles – synthetic	0.1	0.0%
Wood and straw	58.7	12.0%
Green waste	285.8	58.5%
Food waste	138.1	28.3%
Hazardous	0.0	0.0%
Other	0.0	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	0.0	0.0%
Plastics	3.7	0.8%
Ferrous metal	0.1	0.0%
Non-ferrous metal	0.0	0.0%
Nappies	0.0	0.0%
Total	**488.6**	**100.0%**

Chart 21 – Shire of Kalamunda– Composition of Organics Stream



6.5 Shire of Mundaring

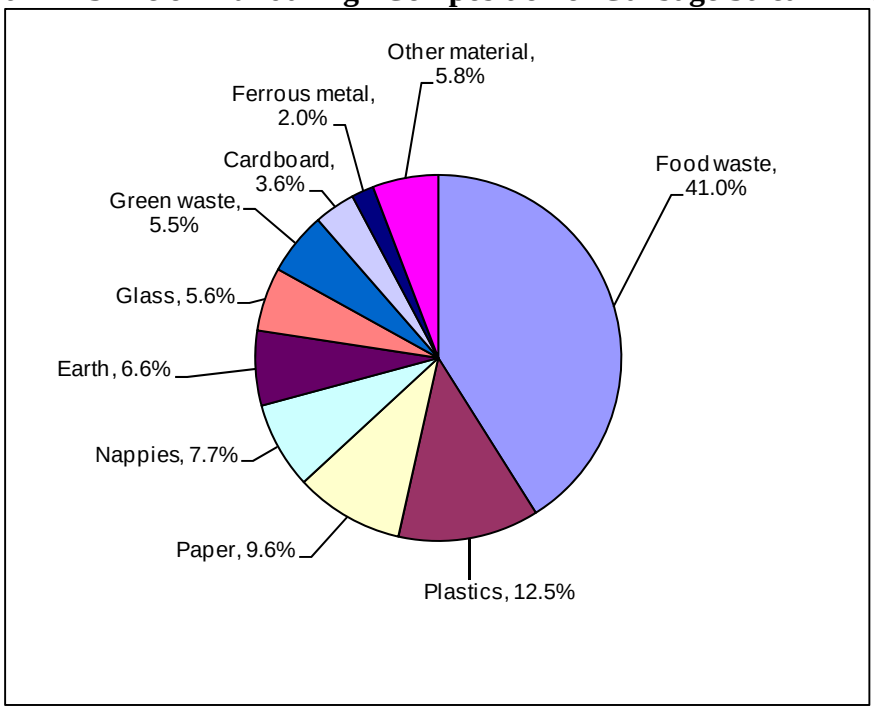
6.5.1 Pre Trial

Table 41 and accompanying Chart 22 show the composition of the waste stream for the Shire of Mundaring pre trial. In this sample, green waste was 5.5% and food waste was 41% respectively.

Table 41 - Shire of Mundaring– Composition of Garbage Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	51.6	9.6%
Cardboard	19.5	3.6%
Textiles – natural	5.1	1.0%
Textiles – synthetic	7.1	1.3%
Wood and straw	0.6	0.1%
Green waste	29.7	5.5%
Food waste	219.9	41.0%
Hazardous	0.3	0.1%
Other	12.1	2.3%
Miscellaneous	1.2	0.2%
Medical	0.5	0.1%
Earth	35.4	6.6%
Glass	30.2	5.6%
Plastics	66.7	12.5%
Ferrous metal	10.5	2.0%
Non-ferrous metal	4.2	0.8%
Nappies	41.1	7.7%
Total	**535.7**	**100.0%**

Chart 22 – Shire of Mundaring– Composition of Garbage Stream Pre Trial



6.5 Post Trial

Table 42 and accompanying Chart 23 below show the waste stream composition for the post trial sample. Green waste accounted for 1.2% of this sample. Food waste accounted for 20.6%, which was the single largest component of the waste stream.

Table 42 - Shire of Mundaring – Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	49.0	14.0%
Cardboard	12.1	3.4%
Textiles – natural	6.3	1.8%
Textiles – synthetic	3.4	1.0%
Wood and straw	1.2	0.3%
Green waste	4.2	1.2%
Food waste	72.3	20.6%
Hazardous	1.8	0.5%
Other	25.7	7.3%
Miscellaneous	10.1	2.9%
Medical	2.2	0.6%
Earth	40.5	11.5%
Glass	14.7	4.2%
Plastics	55.6	15.8%
Ferrous metal	8.1	2.3%
Non-ferrous metal	4.4	1.3%
Nappies	39.6	11.3%
Total	**351.2**	**100.0%**

NB: 'Hazardous' – boxes of matches, chemicals, batteries and fluoro lights.
'Other' – shoes, rubber, spark plugs, ceramics, toys, oil filters, electrical equipment.
'Misc' – vacuum cleaner bags and dust.
'Medical' – medicines, packets of first aid cream.
'Earth' – dirt, rocks and timber.

Chart 23 – Shire of Mundaring– Composition of Garbage Stream Post Trial

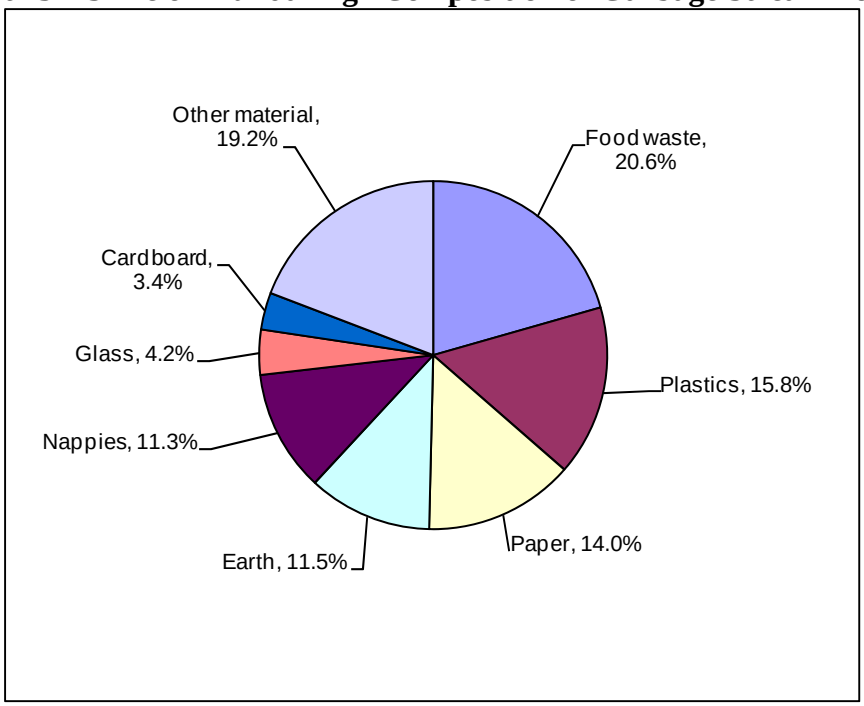
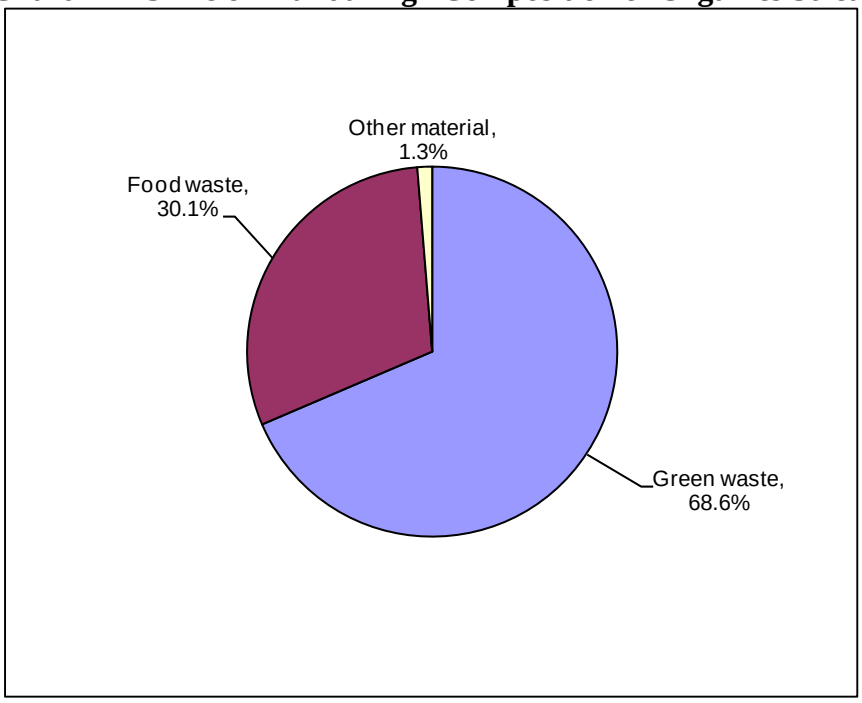


Table 43 and accompanying chart 24 show the composition of the organics stream from the trial. Collectively, food and green waste accounted for nearly 100% of the total.

Table 43 - Shire of Mundaring– Composition of Organics Stream

Material	Weight (kg)	Per cent
Paper	0.4	0.1%
Cardboard	0.2	0.0%
Textiles – natural	0.0	0.0%
Textiles – synthetic	0.2	0.0%
Wood and straw	0.0	0.0%
Green waste	388.9	68.6%
Food waste	171.0	30.1%
Hazardous	0.0	0.0%
Other	0.0	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	5.9	1.0%
Glass	0.4	0.1%
Plastics	0.2	0.0%
Ferrous metal	0.0	0.0%
Non-ferrous metal	0.0	0.0%
Nappies	0.0	0.0%
Total	**567.2**	**100.0%**

Chart 24 – Shire of Mundaring– Composition of Organics Stream



6.6 City of Swan

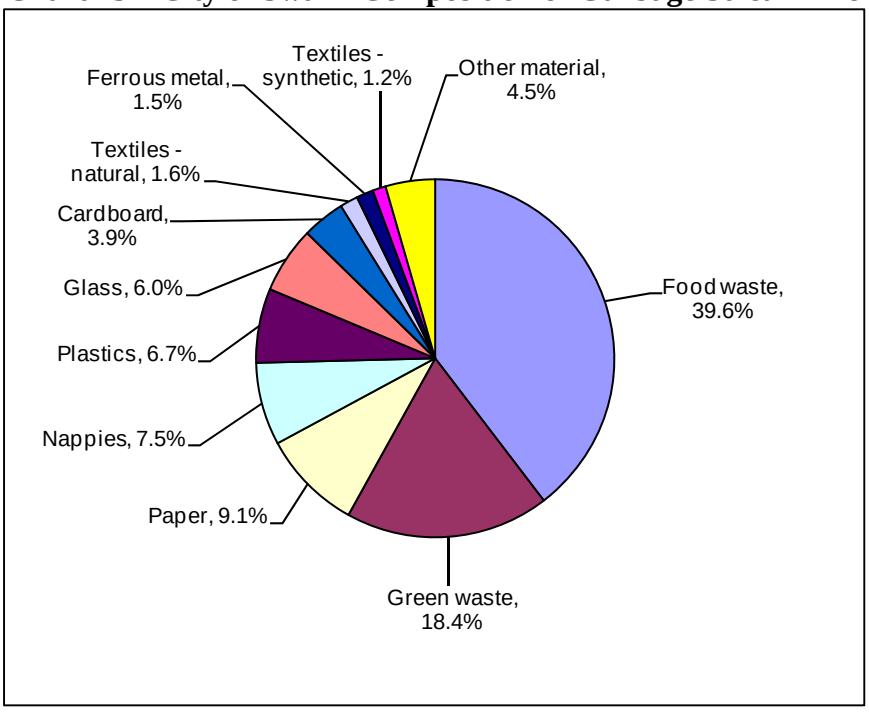
6.6.1 Pre Trial

Table 44 and accompanying Chart 25 show the composition of the waste stream for the City of Swan pre trial. In this sample, green and food waste accounted for 18.4% and 39.6% respectively.

Table 44 - City of Swan– Composition of Garbage Stream Pre Trial

Material	Weight (kg)	Per cent
Paper	91.2	9.1%
Cardboard	38.8	3.9%
Textiles – natural	16.3	1.6%
Textiles – synthetic	11.9	1.2%
Wood and straw	2.1	0.2%
Green waste	184.8	18.4%
Food waste	397.3	39.6%
Hazardous	0.8	0.1%
Other	21.6	2.2%
Miscellaneous	4.1	0.4%
Medical	1.1	0.1%
Earth	9.5	0.9%
Glass	60.3	6.0%
Plastics	67.3	6.7%
Ferrous metal	15.4	1.5%
Non-ferrous metal	5.6	0.6%
Nappies	74.8	7.5%
Total	**1,002.9**	**100.0%**

Chart 25 – City of Swan– Composition of Garbage Stream Pre Trial



6.6.2 Post Trial

Table 45 and accompanying Chart 26 below show the waste stream composition for the post trial sample. Green waste accounted for 5.4% of this sample. Food waste accounted for 28%, which was the single largest component of the waste stream.

Table 45 - City of Swan– Composition of Garbage Stream Post Trial

Material	Weight (kg)	Per cent
Paper	73.5	19.5%
Cardboard	13.9	3.7%
Textiles – natural	15.3	4.1%
Textiles – synthetic	2.8	0.7%
Wood and straw	6.4	1.7%
Green waste	20.4	5.4%
Food waste	105.4	28.0%
Hazardous	0.3	0.1%
Other	7.0	1.9%
Miscellaneous	9.4	2.5%
Medical	0.0	0.0%
Earth	6.1	1.6%
Glass	29.2	7.8%
Plastics	39.8	10.6%
Ferrous metal	5.2	1.4%
Non-ferrous metal	3.1	0.8%
Nappies	38.8	10.3%
Total	**376.6**	**100.0%**

'Hazardous' – batteries, glue, chemicals, vibrators, candles, electric jugs, luggage and toys.
'Miscellaneous' – batteries and dust.
'Medical' – tools and medicines.

Chart 26 – City of Swan– Composition of Garbage Stream Post Trial

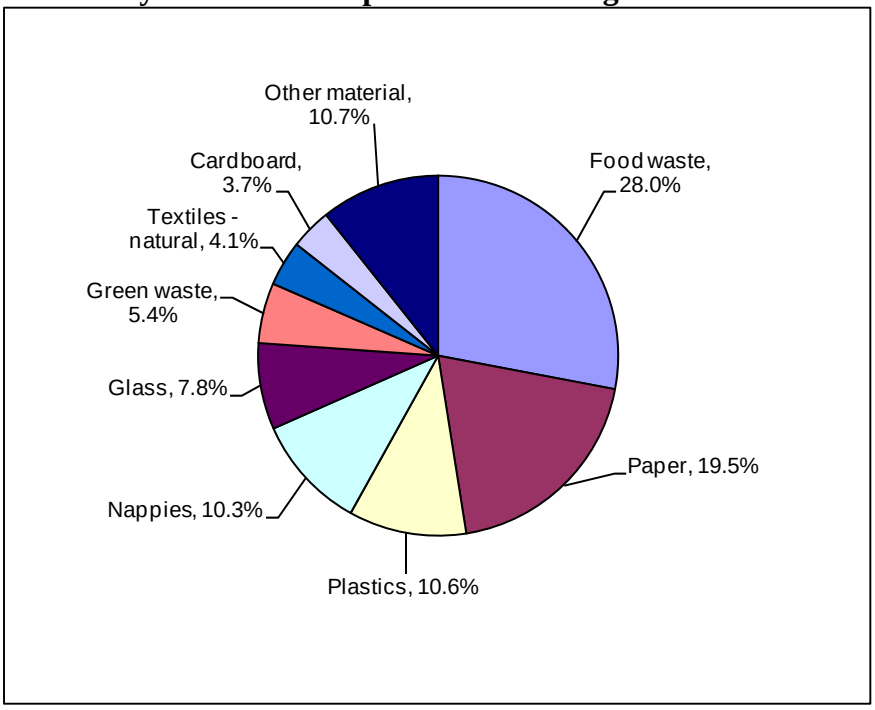
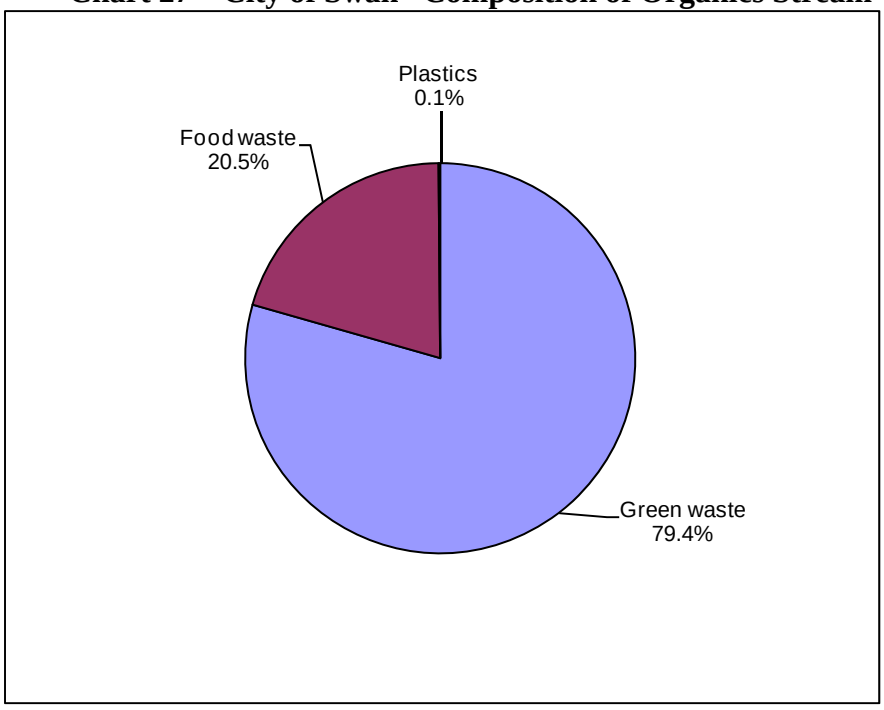


Table 46 and accompanying Chart 27 show the composition of the organics stream. Collectively food and green waste accounted for nearly 100% of the total, with only 0.1% contamination (plastics) being recorded. Caution needs to be exercised with this result as when the sample collection vehicle emptied the organics sample at the sorting depot, it became apparent that the same vehicle had been used to collect garbage the previous afternoon and had not been emptied prior to commencing the organics sample collection. APC's supervisor had recorded the bin volumes and enabled APC's audit team to separate out what should have constituted an organics only load. However, this incident introduces a margin of error in the audit process.

Table 46 - City of Swan– Composition of Organics Stream

Material	Weight (kg)	Per cent
Paper	0.0	0.0%
Cardboard	0.0	0.0%
Textiles – natural	0.0	0.0%
Textiles – synthetic	0.0	0.0%
Wood and straw	0.0	0.0%
Green waste	185.6	79.4%
Food waste	47.8	20.5%
Hazardous	0.0	0.0%
Other	0.0	0.0%
Miscellaneous	0.0	0.0%
Medical	0.0	0.0%
Earth	0.0	0.0%
Glass	0.0	0.0%
Plastics	0.3	0.1%
Ferrous metal	0.0	0.0%
Non-ferrous metal	0.0	0.0%
Nappies	0.0	0.0%
Total	**233.7**	**100.0%**

Chart 27 – City of Swan– Composition of Organics Stream



6. MOISTURE TESTING

The EMRC specified that moisture analysis was required of the garbage and organics samples. The EMRC provided two laboratory ovens set to 105°C for moisture analysis of three one-kilogram samples of food, composite waste and garden waste from the garbage stream of each of the six (6) participating EMRC councils (i.e. 18 samples in total). The pre and post weights of the samples were recorded after the samples had been in the ovens for 24 hours. By subtracting the weight of the sample after it was removed from the oven from the weight of the sample before it was placed in the oven, the percentage of moisture loss per sample can be calculated. The results are provided below:

6.1 Pre Trial

The average moisture content of components of the garbage stream with ranges is provided in table 47 below. The composite sample included everything in proportion to the sample collected and audited; i.e after all samples had been sorted a representative sample was recreated of all of the individual components, in proportion to their volume of the total sample audited. Clearly, there is a substantial range within the samples, with food having the highest moisture content followed by green waste and the composite sample.

Table 47 - Average Moisture Content of Garbage Stream – Pre Trial

Waste category	Average moisture content	Range #
Food	65%	49 – 77%
Green waste	54%	17 – 76%
Composite	33%	16 – 46%

Minimum and maximum values for individual councils

6.2 Post Trial

Table 48 shows the overall average moisture content of each of the garbage samples taken from the garbage stream, aggregated across the six councils, with a low–high range.

Table 48 - Average Moisture Content of Garbage Stream

Category	Average Moisture Content	Range (1)
Food	56%	47 – 66%
Green waste	46%	35 – 60%
Composite	30%	11 – 45%

1: Minimum and maximum values for individual councils

Table 49 shows the average moisture content of food and green waste in the organics stream also aggregated across the six councils and with a low–high range.

Table 49 - Average Moisture Content of Organics Stream

Category	Average moisture content	Range (1)
Food	54%	31 – 70%
Green waste	51%	41 – 65%

1: Minimum and maximum values for individual councils

7. CONCLUSION

The organics trial has shown that the introduction of a dedicated bin for the collection of food and garden waste has the capacity to divert significant proportions of these streams from the general garbage stream and from landfill.

Overall, the garbage stream decreased by 4.2kg per household per week with the introduction of the organics bins, with specific decreases in garden waste of 14.1% and food waste by 7.8%. However, total waste generated when the garbage stream and organics bins were added increased from 16.3kg to 23.55kg. This increase in total waste generation came directly from the organics stream which represented 10.65kg per household. Even in Bayswater where an existing green waste collection service already generated 5.9kg per household, the trial increased the amount of green waste collected to 11.2kg per household.

The trial showed extremely low levels of contamination were evident at less than 1%, suggesting a good understanding by ratepayers of the materials that were accepted in the organics stream.

However, garbage composition data and field observations revealed that only a small amount of food waste was being diverted to the organics bin. The proportion of green waste in the garbage bin more than halved with the introduction of the organics bins, whereas food decreased by only less than one-third.

APC's audit supervisor observed that most of the organic bins only had a small amount of 'bio-bags'/food in them with little green waste. In some cases, garden waste was obvious in the corresponding garbage bins. This was the case where the organics bin volumes were low (less than 5%). In these instances, the contents were predominantly food waste suggesting the bins were not really being used for garden waste disposal.

Where the organic bin volumes were greater than 20% (more than 20% full) the materials present were predominantly garden waste and only small amounts of food were present in these bins. APC's audit supervisor interpreted this to mean that residents were confused that the one "organics" bin could be used for ***BOTH*** food and garden waste.

This observation may also suggest that the introduction of an organics collection system at the same time as the 'bio-basket' may have confused some residents.

APC's audit supervisors also observed in the field that the bin lid colours chosen for the organics bin were in some cases almost identical to the garbage bin lid colour, which may have added to the confusion. Whilst the organics bins were stickered on the lid with a "nature green" coloured sticker, placing stickers on the lid and front of future organics bins of a greater colour contrast may alleviate any confusion, such as the example used in a Sydney suburb where the sticker and lid colour clearly distinguish the bin's purpose.

APPENDIX 1 – EMRC DATA COLLECTION SHEET

Collector: _____ Date:

Code	Street Number	Street Name	Volume		Comments
			G	O	
1					
2					
3					
4					
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28					
29					
30					
31					
32					
33					
34					
35					

EMRC DATA COLLECTION SHEET

Collector: _____ Date:

Code	Street Number	Street Name	Volume		Comments
			G	O	
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					

APPENDIX 2 – SORTING SHEETS AND CATEGORIES

ORGANICS BIN COMPOSITION REPORT

Local Government			**Sorting Date**
Waste category	**Weight kilograms**	**%**	**Comments**
Paper			
Cardboard			
Textiles – natural			
Textiles – synthetic			
Wood and straw			
Green waste			
Food waste			
Hazardous			
Other			
Miscellaneous			
Medical			
Earth			
Glass			
Plastics			
Ferrous			
Non-ferrous			
TOTAL			
Moisture content			

GARBAGE BIN COMPOSITION REPORT

Local Government			**Sorting Date**
Waste category	**Weight kilograms**	**%**	**Comments**
Paper			
Cardboard			
Textiles – natural			
Textiles – synthetic			
Wood and straw			
Green waste			
Food waste			
Hazardous			
Other			
Miscellaneous			
Medical			
Earth			
Glass			
Plastics			
Ferrous			
Non-ferrous			
TOTAL			
Moisture content			

Definitions

Other – Items that are specifically identified (Can be identified but do not fall into any other category)

Miscellaneous – Items that cannot be identified (they are too mashed, crushed or small to know what they are)

APPENDIX 3

MOISTURE TESTING RECORDING SHEET

Council	Drying Date	Waste Category	Weight before drying (g)	Weight after drying (g)	Moisture content
Bassendean		Food			
Bassendean		Green Waste			
Bayswater		Food			
Bayswater		Green Waste			
Belmont		Food			
Belmont		Green Waste			
Kalamunda		Food			
Kalamunda		Green Waste			
Mundaring		Food			
Mundaring		Green Waste			
Swan		Food			
Swan		Green Waste			